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PARTIAL NEPHRECTOMY VERSUS PYELOLITHOTOMY AND NEPHROLITHOTOMY IN THE TREATMENT OF LOCALIZED CALCULOUS DISEASE OF THE KIDNEY, WITH A REPORT OF 17 PARTIAL NEPHRECTOMIES

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A REVIEW of the urological literature of the past 50 years leaves one with the impression that partial nephrectomy in the treatment of localized renal diseases, especially localized calculous pyonephrosis, has achieved widespread but not universal acceptance. It seems hardly necessary to reaffirm the value of this operation in this era of enlightened urology. It is true that the problems of partial nephrectomy are sufficiently complex to tax the diagnostic acumen and surgical skill of every urologist. Difficult as these problems may appear, they do present a challenge which can only be met with confidence when our urologists are carefully trained to handle these unique problems of renal surgery. It is regrettable that there exists a group of urologists who, although they comprise one of the most significant and important sources of positive and constructive urological teaching, have overlooked or dismissed the standardized criteria for the use of this conservative operation in the treatment of selected cases of localized renal disease. In condoning the use of the radical nephrectomy in such localized diseases of the kidney, they have not infrequently offered dubious arguments and theories lacking clinical and experimental substantiation. By their actions and teachings they have ignominiously retarded the utilization of a time-tested conservative procedure designed to preserve rather than remove valuable functioning renal tissue. We are greatly indebted to a group of progressive urologists including Mathe, Campbell, Kretschmer, Lowsley, Engle, Hess, and others, who have devoted themselves intensively and realistically to the problems of conservative renal surgery.

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Terminology. It is essential to establish an exact definition of partial nephrectomy. In this article the authors employ this term to designate the removal of a small portion (usually one pole) of a normally formed kidney or a congenital or acquired solitary kidney in which certain localized diseases have occurred. The term may also apply to the removal of a small portion of one component of a congenital anomalous kidney, i.e., the lower pole of the lower segment of a double kidney as reported by Twinem.

Partial nephrectomy has been used synonymously with caliectomy or calycine resection. The latter two terms specifically infer the removal of one calyx, whereas the portion of the kidney removed in a partial nephrectomy may or may not include a calyx. Papillectomy, i.e., intrarenal operation for the removal of one pyramid or papilla, is also a partial nephrectomy, technically speaking. Partial nephrectomy is also frequently referred to as a partial resection of the kidney or renal resection, but the latter terms are somewhat

ambiguous as to the exact nature of the operation. Ambiguity also applies to the use of the term, "polar partial nephrectomy" to indicate removal of one pole of the kidney, and the term "median partial nephrectomy" to indicate removal or resection of the midportion (middle calyx) of a kidney.

Partial nephrectomy is not to be confused with heminephrectomy which infers the removal of one component, i.e., one-half, of a congenital anomalous kidney of the fusion variety, such as double kidney, horseshoe kidney, sigmoid kidney, and unilateral elongated kidney. This distinction is established purely on an anatomical basis as the physiologic, pathologic, and surgical features of both operations are essentially alike.

Partial nephrectomy for localized renal diseases. The extensive experimental studies of Tillman, Tuffier, Bardenheuer, Paoli, Berti, and others in the last quarter of the past century have established the feasibility of partial nephrectomy in the treatment of localized diseases of the kidney. At the onset this operation was received with great acclaim and considerable enthusiasm by the general surgeon of that period. However, it soon fell into disrepute because of the numerous failures resulting from an inadequate knowledge of the pathology and physiology of the kidney, incorrect diagnosis, faulty surgical technique, and the injudicious and unrestricted use of the operation in poorly selected cases.

With the dawn of the new century came the introduction of new urological and roentgenographic diagnostic measures which enabled the urological surgeon to establish and standardize the criteria for this operation. These precautionary measures and refinements in surgical technique have been responsible for the increasing popularity of partial nephrectomy and its gradual supplanting of radical nephrectomy and nephrostomy in the treatment of localized diseases of the kidney.

It is now generally accepted that partial nephrectomy is indicated in the operative treatment of the following localized diseases of the kidney, viz., (1) cysts: solitary serous, localized multilocular, and hydatid, (2) benign tumors, (3) localized hydronephrosis or pyonephrosis with or without stone formation, (4) infarcts, and (5) renal trauma, when one portion of the kidney is macerated or detached and the remainder is unimpaired. The operation is contraindicated in the treatment of malignant neoplasms, tuberculosis, and polycystic disease. The authors also are opposed to the use of partial nephrectomy in the treatment of renal carbuncle and extensive cortical abscess. These views are based on the poor results reported in such cases as found in our study in 1937. It is conceivable that the urological surgeon may encounter rare instances in which other renal diseases may be so well localized and readily removable that partial nephrectomy may be performed with good results and without undue risk. Recently Puigvert Gorro, Vermooten, and Mathe have employed partial nephrectomy in the treatment of those renal neoplasms which are well encapsulated and sharply localized to one pole of the kidney. However, in the light of our personal experience with renal neoplasms, we are inclined to treat such lesions by nephrectomy.

In the remainder of this article we shall confine our remarks to the use and value of partial nephrectomy in the treatment of localized hydronephrosis or pyonephrosis accompanied by calculus in the affected calyx.

Calycine calculi; pathogenesis and associated pathology. We are indebted to Randall for his outstanding contributions to the pathogenesis of calycine calculi. The initiating lesion is a local tissue change of an inflammatory, trophic, or allergic nature occurring at the tip of the papilla. Following the initial lesion a subepithelial deposition of calcium ensues which later becomes denuded and acts as a nidus for calculus formation. In this manner the calculus is formed within the confines of a terminal calyx. The usual fate of such a calculus is its passage out into the pelvis or ureter with the calycine urine. Less frequently the calculus remains within the calyx as a result of (a) firm attachment of the primary calcareous nidus to the papilla or calycine mucosa, or (b) obstruction to the mouth or infundibular portion of the calyx of an abnormal anatomical or intrinsic pathological nature. When the calculus remains in the calyx, it continues to grow and fill the entire calyx and may even extend into the pelvis and adjoining calyces. Calycine stones may be single or multiple.

Occasionally the minute calculi attached to the papilla may tend to grow back within and along the collecting tubules. Randall and others have shown that such stones appear as a "carpet tack" with its top covering the apex of the papilla and its shank extending up on one of these tubules. Thus the shank portion may be lodged within a tubule and when the mouth of the tubule is occluded there is the appearance of a parenchymal calculus.

Most urologists are unfamiliar with the clinical and experimental studies of the pathogenesis of renal calculi and renal calcification performed prior to and following Randall's epochal contribution.

Some of the outstanding contributions to these subjects are enumerated below.

1. Virchow (1855) stressed the etiological relationship of destructive bone diseases to a special type of calcification which occurred in the kidney and other organs, and which he called metastatic calcification (*Kalkmetastasen*).

2. Henle (1862) described the deposition of calcium salts in the renal substance, which he designated as calcium infarcts.

3. Beer (1904) observed calcium deposits in the tubular epithelium in 53 per cent of 100 kidneys studied microscopically and macroscopically; none were observed in persons below the age of 24 years.

4. Caulk (1912) described a case of calcareous papillitis, which was the etiological lesion responsible for a calcium phosphate stone found in the affected kidney.

5. Schmidt (1913) emphasized the role of nephritis as a primary factor in pathological calcification in the kidney and other organs, and described general calcification with involvement of the kidney (*Kalkgicht*) in cases of calcium gout without evident bone destruction.

6. Brand and Holtz (1920) described the calcium deposits in the kidney in experimental hypervitaminosis; these deposits were found in the cells and basement membranes of the collecting tubules and were confined to a narrow zone in the cortex.

7. Robison (1923) demonstrated the presence of an active enzyme, phosphatase, in tissues undergoing calcification and ossification, i.e., bone, ossifying cartilage, and tissues which become the site of calcium deposits, such as the kidney.

8. Leriche and Policard (1926) demonstrated that the deposition of calcium takes place in connective tissue and structures of low metabolism if the blood supply is diminished, particularly in the presence of hypercalcemia.

9. Lichtenstern (1926) described a condition designated as microlithiasis in which minute uric acid calculi filled the lumen of the tips of the collecting tubules.

10. Huggins (1933) studied kidneys removed because of large stones and found deposits of calcium beneath the epithelium of the collecting tubules.

11. Anderson (1940) observed the occurrence of single and multiple deposits of calcium salts in the cortex or medulla in 1,500 autopsies, and found microscopic deposits in 12 per cent of the cases.

12. Rosenow (1940) studied the kidneys in 239 autopsies and found 22.2 per cent with calcareous plaques on the papillae and 5.4 per cent with calycine calculi. In 5 of 13 cases of calycine calculi, the calculi were adherent to the papillae, and bacteria were found in the papillae in 64.9 per cent of the cases. Microscopic intramedullary calcification was found in 4 of 24 papillae which grossly did not show plaques at the tips of the papillae. The age, sex, grade of arteriosclerosis, and autopsy diagnosis were not important factors.

13. Kjolhede and Lassen (1942) found neither macroscopic nor microscopic evidence of calculi or calcium deposits in or on the papillas in 49 of 135 kidneys examined.

Parenchymal or cortical stones are rare pathological entities. In the absence of a calycine or infundibular obstruction, calycine dilatation is relatively slight as the stone increases in size and fills up the calyx. In such cases the stone may appear to be situated in the parenchyma, completely devoid of any connection with an adjacent calyx or the pelvis, but in reality it communicates with one of these structures through a narrow channel. Parenchymal stones seldom cause symptoms sufficient to warrant operation. They are usually small and enclosed in a mass of fibrous tissue. They are most commonly found at autopsy, but occasionally may be seen on the roentgenogram or pyelogram. In all probability, cortical calculi represent masses of dystropic calcification. The only accurate means of differentiating between a calycine and a cortical calculus is a microscopic examination of the epithelial lining of the cavity surrounding the calculus. Transitional epithelium is found lining the dilated calycine cavity containing a calculus, whereas cuboidal or flattened epithelium derived from the renal collecting tubules is found lining the cavity surrounding a true cortical calculus.

The size and distribution of the various types of calculi within the kidney are indicated in Table I. The most common site of calycine stones is the inferior calyx. This is substantiated by Twinem who found that 65 per cent occurred in the inferior calyx, 20 per cent in the upper calyx, and the remainder in two or more calyces. Braasch and Foulds observed calycine stones in 13.05 per cent of 819 cases and cortical stones (probably true calycine calculi) in 15.88 per cent. In the series of 193 partial nephrectomies for localized lithiasis, the authors found the calculi in the lower calyx in 107 cases (55.4 per cent), in the upper calyx in 56 cases (29 per cent), in the middle calyx in 8 cases (4.3 per cent), and in an undetermined location in 25 cases (12.9 per cent).

Joly attributes the predilection of stone formation within the inferior calyx to the fact that

TABLE I.—DISTRIBUTION OF RENAL CALCULI

Year			1924	1926	1928	1934	1937	1937	1937	1937	1937	1937
Author			Braasch and Foulds	Young	Joly	Winsbury-White	Campbell (children)	Legueu	Israel	Fedorov	Rosving	Twinem
Total				180	167	116	35	76	572	241	589	283
Unilateral				159	167	87	25	42				283
Bilateral			77	21	13	20	9	34	57	32	94	
Large			300				2					
Small			519				33					
Single			467	105	95		13					
Single	Pelvis (alone)		644		80		25					93
Single	Ureteropelvicjunct.				4		2					10
Single	Parenchymal cortical		135									3
Multiple			368	75	72		24					147
Multiple	Branched (coralliform)		85		16							41
Multiple	Pelvis and calyces				41							13
Multiple	Pelvis and ureter											10
Multiple	Calyces (none in pelvis)		111		5							123
Calyceal (excluding coralliform)			111				4					136
Calyceal calculi (exclusive of coralliform)	Upper	Upper (alone)			1							51
		Single										21
		Multiple										30
	Middle	Middle (alone)			2							9
		Single										8
		Multiple										1
	Lower	Lower (alone)			12							87
		Lower with pelvic stone										13
		Single			12							62
		Multiple			15							25
	Multiple calyceal											13
	Multiple	All calyces										5
		Middle and lower										2
		Upper and lower										4
		Upper and middle										2
No details					3							

anatomically this calyx is situated at a lower level than the pelvis and ureter. Urinary excretion from each calyx occurs at the rate of 3 drops per minute and drainage from this calyx is uphill and too sluggish to wash out the calcareous particles in the dependent portion of this calyx. The other calyces may also exhibit retentive properties as a result of faulty anatomical development or congenital or acquired obstruction to the mouth or infundibulum of the calyx.

The role of this so-called "dysuric" calyx in the formation of calycine calculi has also been stressed by other authors, viz., Narath, Coidan, Rose, and Twinem.

The localized pathologic changes associated with a calycine calculus are dependent upon the degree of obstruction to the outflow of urine from the calyx caused by the stone per se or by anatomical or intrinsic pathological changes in the calyx or its infundibulum. In the latter instance, the calycine cavity undergoes a gradual dilatation containing a variable amount of urine. With the increase in the size of the calycine cavity, the fluid pressure causes a gradual atrophy of the renal papilla. Thus the calycine cavity becomes quite distended and is transformed to a soft cystic swelling through the walls of which the calculus can frequently be palpated. The distention of the calyx may extend almost to the capsule of the kidney and occasionally grow to the size of a hen's egg, closely simulating a solitary serous cyst. However, the discovery of an orifice, which communicates with the pelvis, but is obstructed by stones, reveals the true nature of the dilated calyx.

Untreated and undiagnosed, a localized area of calculous hydronephrosis sooner or later becomes infected. The calycine cavity becomes filled with purulent urine and the adjacent parenchyma in the affected area shows all stages of gradation between hydronephrosis and pyonephrosis. The infection is usually hematogenous and the infecting organisms in the order of their relative frequency are the staphylococcus albus, Bacillus coli, Bacillus proteus, the streptococcus, and others. The introduction of infection within the calycine cavity is a serious complication. It hastens the destruction of the affected area and forms a septic focus from which toxins are absorbed.

It is interesting to note that the localized dilatation of a single calyx associated with a calycine calculus was first described as a partial or localized hydronephrosis by Fenger in 1873. Subsequently other terms have been employed to describe the same condition, viz., localized caliectasis (Caulk, 1912), hydrocalyx or hydrocalycosis (Lower, 1924, Watkins, 1939, Winsbury White, 1939) and calycine diverticulum (Prather, 1941, Stirling, 1942). As indicated previously, a careful examination of every dilated calyx will disclose a small narrow communication with another calyx or pelvis despite the failure to demonstrate the communication pyelographically. The dilated calyx must be differentiated from an intrarenal cyst. The latter condition was first described as "kyst urinaire" by Rayer in 1837 and later as a pyelogenous cyst by Damm in 1932, Quinby and Bright in 1935, Oconor in 1935, and by others. The intrarenal cyst represents an unusual dilatation of one or more collecting tubules to form a cyst and is secondary to a localized obliterative papillitis or pyelonephritis. The lining of such a cyst is composed of a solitary layer of flattened epithelium resembling the lining of a solitary cyst. The senior author has recently encountered 2 intrarenal cysts which were successfully treated by partial nephrectomy.

Statistics concerning partial nephrectomy for localized calculous disease.[1] The authors have attempted to collect all the reported cases of partial nephrectomy for localized calculous disease in the literature. These findings are noted in Table II. This report includes an initial group of 58 cases collected in 1937 and a second series of 135 cases, including 17 personal cases, collected in 1949.[2] It is interesting to note that in the intervening 12 years between reports, the number of these operations more than doubled the number that were performed in the 50 years preceding 1937. This may be interpreted as an indication of the increasing popularity of this operation in recent years.

Mortality. There were only 5 deaths in the series of 193 cases, an operative mortality of 2.58 per cent. The mortality rate was 3 times greater in the early series. The cause of 3 deaths (5.1 per cent) in the early series of 58 cases was postoperative pneumonia in 2 cases (Cummings, and Goldstein and Abeshouse), and renal insufficiency and uremia in 1 case (Cummings). In the later series of 118 cases, there were only 2 deaths (1.7 per cent), one following secondary hemorrhage due to a postoperative renal aneurysm (Kahle and Schenken) and the other following a severe wound infection (Wenzel). There were no deaths in the authors series of 17 personal cases (Table III).

Morbidity. The incidence of postoperative complications was surprisingly low for the entire series. There were 6 cases of secondary hemorrhage in the combined series of 193 cases, an incidence of 3.1 per cent. This complication was encountered by Yunck and Forsythe in 2 cases, and by Kahle and Schenken, Twinem, Mathe, and the authors in 1 case, respectively. A secondary nephrectomy was performed for secondary hemorrhage in 3 cases (Yunck and Forsythe, and authors) with no deaths. In the other 3 cases, the hemorrhage ceased spon-

[1]Since this paper was submitted for publication, 5 additional cases of successful partial nephrectomy for localized calculous disease have been reported, viz., P. Aboulker. *J. urol. med.*, Par., 1949, 55: 75 (1 case—female, 26 years, lower pole of right kidney removed) and M. M. Mayers and A. J. Campbell. *Urol. Cut. Rev.*, 1949, 53: 713 (4 cases—male, 38 years, lower one-fourth of left kidney; female, 32 years, upper one-third of right kidney; female, 48 years, lower one-fourth of right kidney; and female, 52 years, upper pole of right kidney.

[2]Since this article was submitted for publication, the senior author has performed 2 additional successful partial nephrectomies for localized calculous disease, (1) in a male aged 38 years (lower half of right kidney), and (2) in a male aged 30 years (lower third of right kidney). These 2 cases plus the 5 mentioned in footnote No. 1 bring the grand total of partial nephrectomies for localized calculous disease to 200.

TABLE II.—TABULATION OF PARTIAL NEPHRECTOMIES FOR LOCALIZED CALCULOUS DISEASE

Year			1937	1949	1949	Total
Authors			Goldstein and Abeshouse collected cases 1887–1937	Abeshouse and Lerman collected cases 1938–1949	Personal cases 1938–1949	
Collected cases			58	118	17	193
Deaths		Cases	3	2	0	5
		Per cent	5.1	1.7	0	2.58
Age		Average	38.2 yrs.	37.2 yrs.	42.6 yrs.	37.4 yrs.
Sex		Male	26	30	14	70
		Female	25	26	3	54
		Not stated	7	62		69
Kidney		Right	25	37	9	71
		Left	25	40	8	73
		Not stated	8	41		49
		Unilateral	56	118	16	190
		Bilateral	2		1	3
Pole		Lower	30	64	13	107(55.4%)
		Upper	25	27	4	56(29.0%)
		Midportion	5	3		8 (4.3%)
		Not stated	1	24		25(12.9%)
Complication	Secondary hemorrhage		0	5	1	6(3.1%)
	Urinary fistula	Permanent	1	1		2(1.0%)
		Temporary			1	1(0.5%)
	Wound infection	Superficial		2	2	4(2.0%)
		Deep	1	3	1	5(2.5%)
	Renal lesions	Pyelonephritis		2		2(1.0%)
		Aneurysm		1		1(0.5%)
	Recurrent stone formation		1	3	0	4(2.0%)
	Secondary nephrectomy	Cases	2	3	1	6(3.1%)
		Deaths	0	1	0	1(0.5%)

taneously. Urinary fistula occurred in 3 cases; 2 were permanent (Bardenheuer and Vickery) and 1 was temporary (authors). The combined incidence for the series was only 1.5 per cent. Wound infection developed in 9 cases (4.6 per cent) and was of the superficial type in 4 cases (Mathe, Campbell, Abeshouse) and deep in 5 cases (Mathe, Campbell, Wenzel, Abeshouse). Kahle and Schenken reported a rare complication, aneurysm of the renal artery.

Recurrent stone formation was observed in 4 (2.0 per cent) of 193 cases, viz., those of Cummings, Twinem, Yunck and Forsythe, and Puigvert Gorro). A secondary nephrectomy for recurrent stone formation was subsequently required in 2 cases (Twinem and Puigvert Gorro).

A secondary nephrectomy was required in 6 cases (3.1 per cent), viz., for secondary hemorrhage in 2 cases (previously mentioned), recurrent stone formation in 2 cases (previously mentioned), renal carcinoma in 1 case (Tuffier), and recurrent hemorrhagic nephritis (Eisendrath). There were no fatalities following secondary nephrectomy.

Age. In the combined series of 193 cases, the average age of the patients was 37.4 years. The age distribution according to decades of life was as follows:

Age	No. of Cases
1–9	1
10–19	4
20–29	25
30–39	49
40–49	42
50–59	12
60–69	5
	138

TABLE III.—TABULATION OF AUTHORS' 17 CASES OF PARTIAL NEPHRECTOMY FOR LOCALIZED RENAL LITHIASIS

Case	Name	Date	Sex	Age	Kidney	Pole		Infection		Hospital days	Complications		Follow up study	Remarks
						Upper	Lower	Preoperative	Postoperative		Fistula	Secondary hemorrhage		
1	R.R.	Apr. 1937	F	29	L	×		+	o	22	×*		12 yrs. 4 mos.	*Temporary—3 months Used muscle in renal wound
2	E.E.	Oct. 1942	M	43	R		×	+	o	14				
3	E.T.	June 1945	M	32	R		×	o	o	11			4 yrs. 2 mos.	
4	R.H.	Dec. 1945	F	38	L		×	o	o	13			3 yrs. 8 mos.	
5	F.C.	Oct. 1946	M	50	L		×	+	+	12			2 yrs. 10 mos.	Left ureterolithotomy 1 year previous
6	D.S.	July 1946	M	45	L		×	+	o	10			3 yrs. 1 mo.	
7	C.K.	July 1946	M	35	L		×	+	+	14			3 yrs. 1 mo.	
8	S.S.	Jan. 1947	M	60	R		×	+	o	10			2 yrs. 7 mos.	
9	J.F.	Feb. 1947	M	39	R	×		o	o	14			2 yrs. 6 mos.	
10	D.S.	Feb. 1947	M	26	R		×	o	o	9			2 yrs. 6 mos.	
11	H.F.*	July 1947	M	50	R	×		+	o	11			2 yrs. 1 mo.	*Bilateral nephrolithiasis Bilateral partial nephrectomy
12	H.F.	Sept. 1947	M	50	L		×	+	o	12			2 yrs.	
13	S.L.	Aug. 1947	F	55	R		×	+	+	19			2 yrs.	Bilateral nephrolithiasis. One year later right nephrectomy for calculous pyonephrosis
14	E.J.	Sept. 1947	M	26	L		×	+	o	27		×	1 yr. 11 mos.	Required secondary nephrectomy on eleventh postoperative day
15	D.D.	Sept. 1947	M	22	R	×		+	o	20			1 yr. 11 mos.	
16	D.C.	Apr. 1948	M	63	L		×	+	o	23			1 yr. 4 mos.	
17	A.H.	Mar. 1949	M	62	R		×	+	o	14			5 mos.	
Total														
16 Unilateral 1 Bilateral			14M 3F	42.4 AV.	9R 8L	4	13	13	4	15 Day AV.	1 5.8%	1 5.8%		

In 55 cases the age was not stated. The youngest patient was 6 years of age (Howze) and the oldest, 64 years (Hyams and Kenyon).

Sex. There were 70 males, 54 females, and in 69 cases the sex was not stated.

Side. The right kidney was involved in 71 cases and the left in 73 cases, the affected kidney not being stated in 49 cases. A bilateral partial nephrectomy was successfully performed in 3 cases, viz., that of Stevens in 1919, in which simultaneous removal of the upper and lower poles of the right kidney, and 2 months later removal of the upper pole of the left kidney were done; that of Cummings in 1934, in which removal of the lower pole of the left kidney, and 4 months later removal of the lower pole of the right kidney, were done; and that of Abeshouse in 1949, in which removal of the upper pole of the right kidney, and 3 months later removal of the lower pole of left kidney, were done. The simultaneous removal of the upper and lower poles of the same kidney was successfully carried out by Fabricius in 1909 and by Stevens in 1919, as noted previously. A partial nephrectomy was successfully performed on a congenital solitary kidney by Pugh in 1933, and on an acquired solitary kidney (the other kidney having been removed for various diseases) in 5 cases, viz., Cummings (2 cases for calculous pyonephrosis), Munger (tuberculosis), Corbus (calculous pyonephrosis) and Puigvert Gorro (pyonephrosis). In 4 cases, a successful partial nephrectomy was followed by the removal of the opposite diseased kidney with good results, viz., Mathe (hydronephrosis) Corbus (hydronephrosis), Begg (calculous pyonephrosis), Abeshouse (calculous pyonephrosis). Hess has successfully treated 5 cases of bilateral renal lithiasis by nephrectomy of one kidney and partial nephrectomy of the other but

gives no details of which operation was performed first.

Portion of the kidney removed. Information concerning the exact amount of tissue removed was not given in most cases except to state the lower or upper pole. The lower pole was removed in 107 cases, the upper pole in 56 cases, and the midportion of the kidney (middle calyx) in 8 cases; the exact site was not stated in 25 cases.

Criteria for partial nephrectomy for localized calculous hydronephrosis. A previous study indicated that partial nephrectomy is the operation of choice when the following criteria can be fulfilled:

1. The calculous disease process must be sharply confined to one area or pole of a kidney as determined by careful urographic study and verified at operation.

2. The operative removal of the affected portion of the kidney must be performed with ease and without undue risk to the patient.

3. The blood supply to the portion of the kidney remaining after operation must be adequate.

4. The portion of the kidney remaining after operation should be able to sustain at least one-half or preferably more of the secretory function of the affected kidney.

In rare instances partial nephrectomy may be an operation of necessity rather than of choice. In such cases it is imperative to preserve as much renal tissue as possible. The following cases belong in this category:

1. When the localized calculous process occurs in a congenital or acquired solitary kidney.

2. When the localized calculous process occurs in a kidney whose mate is of the congenital hypoplastic or acquired atrophic type and hence is unable to carry the entire secretory burden by itself in the event of removal of the diseased kidney.

3. In cases of bilateral calculous disease when the functional capacity of each kidney is seriously impaired. In this type of case, it may be advisable to perform a partial nephrectomy on the better kidney first and after a suitable period of recovery a partial or total nephrectomy of the opposite kidney may be performed, as indicated.

4. When, for various reasons, the presence or function of the opposite kidney is not known or cannot be determined at or before operation.

Contraindications to partial nephrectomy for a localized calculous process. There are definite contraindications to partial nephrectomy as evidenced by a careful analysis in 1937 of the results in 296 collected cases in which this operation was performed for all types of localized renal diseases. These contraindications may be specifically applied to the following cases:

1. When the localized calculous process occurs in a congenitally anomalous kidney whose abnormal blood supply increases the technical difficulties of the operation or makes the operation impossible. This is exemplified by those cases in which the abnormal blood supply firmly anchors the kidney in its bed and thereby prevents delivery of the kidney into the wound and interferes with the actual performance of the operation.

2. When the localized disease process occurs in a kidney which is the seat of severe diffuse infection or extensive calculosis, the function of which is seriously impaired, and in which partial nephrectomy is futile from the standpoint of conserving renal tissue. Under these circumstances, the operation invokes a serious and unnecessary operative risk.

3. When the localized calculous process occurs in a kidney surrounded by dense sclerotic adhesions or fibrolipomatous tissue which has seriously impaired the renal function of the affected kidney and at the same time increases the technical difficulties and the operative risk.

4. When the localized calculous process is accompanied by a serious concomitant disease elsewhere in the same kidney, i.e., tuberculosis, malignant tumor, polycystic disease, or carbuncle, which seriously impairs renal function and militates against a good operative result.

Advantages and disadvantages of partial nephrectomy in localized calculous disease. We believe that partial nephrectomy for localized calculous disease possesses the following advantages: (1) lower mortality, (2) lower morbidity, (3) shorter hospital stay, (4) no recurrence of stone formation, (5) insures complete removal of all stones, and (6) eliminates the etiological factor responsible for localized calculous formation, i.e., calcareous papillitis, localized pyelonephritis, infundibular stricture, or abnormal angulation of calyx.

On the other hand, the following morbidity factors, i.e., accidents at operations and complications during convalescence, are considered by some urologists as disadvantages of the operation: (1) secondary hemorrhage, (2) persistent urinary fistula, (3) urinary leakage, (4) purulent fistula, (5) the persistence or development of various types of intrarenal infections, (6) decreased renal function, and (7) the development of unusual local tissue changes, such as infarcts, aneurysms, or cystic changes.

Since many of the so-called advantages or disadvantages of this operation are more real than apparent, the mere statement of these factors should not be accepted without verification or substantiation by clinical experience. The au-

thors are fully cognizant of the difficulty of evaluating the merits of the conservative and radical operations for renal lithiasis as compared to partial nephrectomy. The available statistics and data on the mortality and morbidity of conservative and radical operations for renal lithiasis, exclusive of partial nephrectomy, usually represent the efforts of one or two master surgeons in a large clinic or hospital. Such reports undeniably do exert a great influence upon the skeptical, uninformed, or inexperienced urologists, whereas the available statistics on the mortality and morbidity of partial nephrectomy comprise a relatively small series of cases and represent the combined efforts of many surgeons in many countries. However, much valuable information can be obtained by comparing the incidence and severity of the mortality and morbidity factors following partial nephrectomy and other conservative and radical operations for renal lithiasis.

Mortality. The mortality rate following conservative and radical operations for renal lithiasis is considerably influenced by the type of operation, individual surgeon's skill, technical difficulties, the presence of intrarenal and perirenal infections, the occurrence of immediate or delayed complications, and the general condition of the patient. For comparative purposes, the mortality rate following partial nephrectomy must be based on the total cases reported rather than on the limited experience of a single surgeon. The largest individual series of partial nephrectomies for localized calculous disease are the 19 cases with no deaths reported by Twinem, and Yunck and Forsythe from Lowsley's clinic, and the 17 cases with no deaths reported by the authors in this article. In the combined series of 193 cases collected by the authors (Table II) there were 5 deaths, a mortality rate of 2.58 per cent. The greater proportion of these fatalities (3 cases) occurred in the early series of 58 operations performed before 1937, thus giving a mortality of 5.1 per cent for this series. This mortality rate of 2.58 per cent for the entire group of partial nephrectomies compares favorably with that reported for all other operations for renal lithiasis. The decrease in the rate in the past 25 years for partial nephrectomy as well as for other operations must be attributed to the greater accuracy in diagnosis, more judicious selection of cases, and improvement in surgical technique.

It is evident from a study of the mortality statistics (Table IV) that pyelolithotomy and partial nephrectomy are relatively benign operations as attested by their low mortality rates of 2.4 per cent and 2.58 per cent, respectively. Pyelolithotomy is the ideal operation for patients with a comparatively small solitary calculus that is easily accessible and removable from a kidney of which the function is relatively unaltered. In the presence of a slight renal infection of recent origin, one is justified in performing this operation. If the infection is severe and chronic in nature and the renal function is seriously impaired, nephrectomy is indicated. The presence of infection adds appreciably to the surgical risk of pyelolithotomy according to Gottstein, who found that the mortality rate in aseptic cases was 1.8 per cent as compared to 5.9 per cent in infected cases.

Nephrolithotomy carries the highest mortality rate of all operations for renal calculi. In the collected statistics of Table IV, it varied from 7.1 per cent to 11.9 per cent, with an average of 9.8 per cent. This operation is more frequently followed by shock, immediate or delayed hemorrhage, persistent urinary fistula, recurrent stone, and other complications than any other conservative or radical operation for lithiasis. Gottstein observed that the mortality rate for nephrolithotomy was higher in the infected cases (14.5 per cent) than in the aseptic cases (7.8 per cent). The various immediate or delayed complications occur more frequently in the infected cases than in the aseptic cases and often require secondary nephrectomy which is an additional mortality risk. The indications for nephrolithotomy are becoming more limited in recent years as the operation is replaced by pyelolithotomy for single stones, pyelolithotomy with intrapelvic coagulum for multiple stones, partial nephrectomy for stones in the upper or lower calyces, and nephrectomy for stones accompanied by serious infection and marked impairment of function. Nephrolithotomy is indicated in the cases in which the pelvis cannot be exposed for anatomical or pathological reasons and when a coralliform stone with branches into two or more calyces is present.

Nephrectomy has a relatively low mortality rate in view of the fact that this operation is usually reserved for severely infected and dilated kidneys. The technical difficulties are usually greater in this operation because of the presence of perirenal adhesions or infection. The operative risk is increased by the presence of infection in the opposite kidney. In the available reports, the mortality for nephrectomy varied from 2.4 per cent to 13.9 per cent, with an average of 6.3 per cent. Gottstein noted that the mortality rate was higher (8.4 per cent) for infected cases.

Morbidity. The authors are of the opinion that the general morbidity rate is lower following partial nephrectomy than after the other conserva-

TABLE IV.—MORTALITY STATISTICS OF CONSERVATIVE AND RADICAL OPERATIONS FOR RENAL LITHIASIS (AFTER GOTTSTEIN)

Year	Author (collected cases)	Total cases			Pyelolithotomy			Nephrolithotomy			Nephrectomy		
		Cases	Deaths	Per cent	Cases	Deaths	Per cent	Cases	Deaths	Per cent	Cases	Deaths	Per cent
	(A) Gottstein												
	1900–1910	694	62	9.2	84	3	3.6	422	48	11.3	188	11	5.8
1926	1910–1920	824	54	6.5	211	6	2.8	356	22	6.1	257	26	10.1
	1920–1925	2123	121	5.7	802	6	0.77	648	48	7.4	673	67	9.9
	Total	3641	237	6.8	1097	15	1.4	1426	118	8.2	1118	104	9.3
1949	(B) Abeshouse and Lerman 1926 to 1949												
1926	Young	98	13		31	3	9.6	24	4	16.6	43	6	13.9
1927	Joly	161	8	4.9	40	3	7.5	58	3	5.3	58	2	3.4
1929	Salleras	135	8		8	1	11.0	14	3		18	2	
1930	Barney and Watson	132	6		56	3					26	1	
1934	Winsbury-White	73	2					29			43	0	0
1937	Oppenheimer	169	12	7.1	91	4	4.4	37	6	16.2	51	4	7.8
1937	Twinem	387	15		146	6	4.1	165	6	3.6	74	3	4.0
1938	Deming	39	1	2.5							39	1	2.5
1944	Mathe and Castillo	77	4	1.1	33	1	3.3	34	3	8.8			
1947	O'Conor	41	1	2.4							41	1	2.4
1949	Winsbury-White	212	9	4.2	63	2		17	0		96	4	
	Total	1524	77	5.05	468	23	4.8	378	27	7.1	489	24	4.9
1924	Rafin	664	59	8.8	70	2	2.9	414	46	11.1	180	11	6.1
1924	Tardo	1043	92	8.8	191	4	2.0	359	43	11.9	489	45	9.2
1924	Cifuentes	3938	293	7.4	1153	29	2.5	1562	162	10.3	1265	102	8.0
1926	Gottstein (A)	3641	237	6.8	1097	15	1.4	1426	118	8.2	1118	104	9.3
1949	Abeshouse and Lerman (B)	1524	77	5.05	468	23	4.8	378	27	7.1	489	24	4.9
	Grand total	10852	758	6.9	2979	73	2.4	4139	396	9.8	3541	286	6.3

tive operations. This impression is based on the comparative study of the incidence of secondary hemorrhage, persistent urinary fistula, purulent fistula, and recurrence of stone following the various conservative operations as indicated in Tables V, VI, and VII. A discussion of each of these complications is presented elsewhere in this article.

Shorter hospital stay. Comparative statistics for the duration of hospitalization following the various conservative and radical operations for renal lithiasis are not available. However, it is our opinion, based on personal experience and a review of the literature, that patients treated by partial nephrectomy have a smoother convalescence and their hospital stay is as short, if not shorter than the hospital stay after pyelotomy or nephrolithotomy. In the authors' series of 17 personal cases, the majority of the patients left the hospital between the eleventh and fourteenth postoperative days, with an average stay of 15 days. The postoperative stay was prolonged in 2 cases because of a temporary fistula following the use of muscle as a hemostatic agent in our very first case in this series, and because of delayed hemorrhage in the other case, which required a secondary nephrectomy. Engle, Hess, Twinem, and others have also commented on the relatively short hospital stay and smooth convalescence of their patients. The absence of postoperative pain in the operative area, and the rapid healing of the wound are particularly conspicuous in cases of partial nephrectomy. We believe that these favorable changes in the length and smoothness of the postoperative course in partial nephrectomy may be attributed to the absence of urinary leakage, complete removal of infected tissue, and the perfect hemostasis attained by a carefully planned and well executed operation. It is well recognized

TABLE V.—SECONDARY HEMORRHAGE FOLLOWING CONSERVATIVE OPERATIONS FOR RENAL LITHIASIS

Year	Author	Pyelolithotomy				Nephrolithotomy								Remarks
		Cases	Secondary hemorrhage	Per cent	Secondary nephrectomy	Cases	Secondary hemorrhage	Per cent	Deaths	Immediate secondary hemorrhage	Deaths	Delayed secondary nephrectomy	Spontaneous cure	
1922	Barney					70	11	15.7		3	2 66.6%		8	
1924	Braasch and Foulds					150	8	5.3		3 3.7%			4	
1924	Cifuentes					626	8.5	13.6	22 25.8%	36 42.3%	9 26.0%		27 31.7%	
1924	Tardo					316	11	3.5	4 3.3%	6 54.5%	1 16.6%		5*	*3 Died, 60 per cent
1924	Israel					204	23	11.5	17 73.9%					
1924	Brongersma	43	2	46		37	2	5.4						
1924	Rafin	32	1	3.1	1									
1924	Hogge	17	1	5.2										
1924	Papin	98	4	4	4	12	4	33.3						
1924	Nicholich	59	2	3.3	2									
1929	Joly					67	2	6		1		1*		*4 yrs. later
	Total	249	10	4		1482	156	10.5						

that the presence of urinary leakage from the operative wound or around a nephrostomy or pyelostomy tube used for drainage following pyelolithotomy, nephrolithotomy, or nephropyelolithotomy increases the susceptibility to renal infection and secondary hemorrhage, which add to the discomfort of the patient, prolong his hospital stay, and increase the likelihood of complications.

Secondary hemorrhage. This serious complication is the "bete noire" of all conservative operations on the kidney. In the early period of renal surgery, there prevailed an unwarranted fear of extensive hemorrhage at the time of operation and of delayed hemorrhage following operation. These complications were unquestionably due to faulty surgical technique, i.e., improper hemostasis, poor suturing, and inadequate drainage, and as a result the conservative operations of pyelolithotomy, nephrolithotomy, and partial nephrectomy fell into disrepute and were supplanted by radical nephrectomy. With the improvements in urologic and roentgenographic diagnostic measures, which resulted in the careful selection of cases, and refinements in surgical technique, particularly the introduction of better hemostatic sutures, these operations have regained their lost prestige.

There is a paucity of statistics concerning the incidence of secondary hemorrhage following conservative operations for renal lithiasis. Studies of the incidence of hemorrhage following nephrolithotomy have been contributed by Von Makkas in 1910, Tschaika in 1915, and Scheyer in 1922, whose results are included in Gottstein's report. The latter collected 215 cases with 34 deaths (11.2 per cent). Secondary nephrectomy was required in 87 (40 per cent). Undoubtedly this complication occurs more frequently than our collected statistics in Table V would indicate. An analysis of these statistics reveals that this complication is more commonly observed after nephrolithotomy (10.5 per cent) and pyelolithotomy (4 per cent) than following partial nephrectomy (3.1 per cent). It is our opinion that the risk of secondary hemorrhage following nephrolithotomy is so great and the consequences are so serious that this operation should be restricted to the cases in which a careful pyelographic study indicates that the calycine calculi cannot be removed through a pyelotomy incision because of an anatomical or pathological abnormality of the pelvis or calyces or because of the unusual size or location of the calycine calculi.

Although secondary hemorrhage is rarely observed following pyelolithotomy, statistical reports have been contributed by Brongersma, Papin, Nicholich, Rafin, and Hogge. Isolated cases have been observed by Joly and the authors. The scarcity of secondary hemorrhage following pyelo-

TABLE VI.—PERSISTENT URINARY FISTULA FORMATION FOLLOWING CONSERVATIVE OPERATIONS FOR RENAL LITHIASIS

Year	Author	Pyelolithotomy				Nephrolithotomy				Remarks
		Cases	Fistulas	Per cent	Secondary nephrectomy	Cases	Fistulas	Per cent	Secondary nephrectomy	
1894	Kuster					20*	3	15		*Bilateral renal lithiasis
1901	Schmeiden	54	12	22.2		211	28	13	17	
1908	Watson					135	11	8		
1909	Watson and Cunningham					309	24	8.1		
1909	Blum and Ultzman	537	3	.55						3 Temporary fistulas
1910	Perineau	42	11	26.1						Pelvis drained
		39	3	7.6						Pelvis not drained
1924	Brongersma	54	1	1.8	1	82	3	3.65	3	
1924	Cifuentes					169	22	13.7		Collected cases
						33	4	12		Personal cases
1924	Tardo	191	1	0.5		288	61	21.1	36	3 Temporary fistulas (1.6%)
1924	Rafin	32	1	3.1						
1930	Barney and Watson	56	9	17.8	2					
	Total	1005	42	4.1		1247	156	12.5		

lithotomy may be attributed to the relative avascularity of the pelvis which receives its delicate intrinsic blood supply from fine branches of the retropelvic and ureteral arteries. The occurrence of secondary hemorrhage following pyelolithotomy may be caused by (1) injury to the retropelvic artery, (2) injury to dilated ureteral or ureteropelvic blood vessels, and (3) injury to the tissues surrounding the mouth or infundibular portions of a calyx during exploration and extraction of a calycine stone. The latter type of injury produces thrombosis of the adjacent arteries and necrosis of the involved tissues with subsequent delayed hemorrhage.

The amount and severity of the delayed hemorrhage following any conservative operation may vary considerably. The bleeding is usually encountered between the seventh and tenth days, but may occur at any time from the first to the twenty-fifth day. The duration of the bleeding may last from a few hours to 3 weeks or more in neglected cases. Prompt recognition of this complication in the early stages is imperative and may permit a secondary operation designed to control the bleeding and preserve the kidney. Delayed bleeding of long standing demands secondary nephrectomy to obtain a cure and to prevent the serious after-effects of severe chronic hemorrhage.

The bleeding is usually accompanied by a slight rise in temperature and pulse. The appearance of blood in the urine or on the dressings is preceded by a feeling of discomfort, fullness, or dull loin pain which may assume the aspects of renal colic due to passage of elongated blood clots down the ureter. In cases of severe hemorrhage, the blood may not clot until it reaches the bladder. Occasionally, the patient with severe hemorrhage suffers from severe anemia or shock. Supportive therapy, i.e., repeated blood transfusion, and the parenteral administration of vitamin K or other thrombinoplastic substances, usually fail to check the bleeding. However, it is not uncommon for the bleeding to cease spontaneously, and in such cases the kidney may exhibit considerable damage and undergo gradual destruction of its tissue and function which demands a nephrectomy at a later date.

The pathogenesis and associated pathology of secondary hemorrhage have not been clearly established. Legueu has maintained that infarction is the chief factor, and Joly has stressed the added role of infection. Another important factor is faulty hemostasis resulting from improper suturing. The experimental studies of Tuffier, Paoli, Goldstein and Carson, Deming, Herbst and Polkey, and others have thrown considerable light on the healing of sutured and nonsutured wounds in the nephrotomized or partially nephrectomized animal. These studies demonstrate that the healing is dependent upon the exuberant production of connective tissue derived from the capsule and interstitial tissue, and is reinforced by reticular

TABLE VII.—RECURRENT STONE FORMATION FOLLOWING OPERATIONS FOR RENAL LITHIASIS

Year	Author	Pyelolithotomy			Nephrolithotomy			Nephro-pyelolithotomy			Nephrectomy			Conservative operations (type not stated)		
		Cases	Recurrence	Per cent	Cases	Recurrence	Per cent	Cases	Recurrence	Per cent	Cases	Recurrence in opposite kidney	Per cent	Cases	Recurrence	Per cent
1910	Perineau	87	5	4												
1915	Cabot and Crabtree	33	17	51	30	17	56							155	66	43
1921	Gayet	12	2	16.6	4	2	50									
1924	Braasch and Foulds	371	44	11.85	104	25	24.03	48	2	4.16	327	9	2.75	677	71	10.48
1924	Cifuentes	359	14	3.9	941	90	9.5				256	6	2.34	1330	104	8
1924	Tardo	191	6	33	316	19	6				489	8	1.8	503	28	5.8
1924	Brongersma	54	9	166	82	22	35.4				68	1	1.4			
1924	Papin	51	1	1.96	9	4	44.4									
1924	Rosving	7	2	28.5	109	44	40.3				31	1	3.2	118	49	41
1924	Joseph	48	12	25	9	1	11.1									
1924	Escat	44	11	25												
1924	Rafin	32	8	25	42	7	16				39	2	5.1	74	15	20
1926	Dobson	28	2	7.1	18	2	11.1				29	3	10.3			
1933	Hellstrom													348	86	25
1934	Van Illyes	510	44	8.7	81	5	6									
1937	Oppenheimer	91	18	24	37	17	58.6	41	20	54				169	55	39
1937	Twinem	102	21	20.9	100	28	28				48	2	4.2			
	Total	2020	216	10.9	1882	283	15	89	22	24.7	1287	32	2.49	4774	474	9.9

tissue derived from the blood elements and by fibrous and fatty tissue. When a portion of the kidney is excised the preserved capsule dips downward and attaches itself to the cut surface. The repair process along the line of incision or excision is more or less localized since the small renal arteries, which are always severed by incision or excision, are terminal in character and the tissue supplied by these vessels undergoes ischemic atrophy or necrosis which leaves a thin layer (1 to 2 mm.) of dead tissue along the edges of the wound. The depth of this dead layer may be increased by the pressure of a nephrostomy tube or improper suturing. In the absence of infection this layer of ischemic tissue is absorbed and replaced by fibrous tissue containing an occasional atrophied or degenerated glomerulus or tubule and showing hyalinization and occasionally the deposition of calcium salts. In the presence of infection in the adjacent tissue, the necrotic layer becomes surrounded by a zone of hyperemia and leucocytosis which delays and impairs healing and may cause sloughing of the affected tissues with subsequent hemorrhage. These same changes may follow the unnecessary or accidental division of accessory poles or cortical vessels. Thus, it is imperative to exercise caution in making the incision for a nephrotomy and a partial nephrectomy through healthy tissue and to preserve the integrity of accessory vessels supplying areas of renal tissue not involved by the localized disease process.

Persistent urinary fistula. This complication was a relatively common sequela of all the conservative operations in the early period of renal surgery. With the recent improvement in surgical technique, there has been a marked decline in its incidence. The available statistics on the incidence of this complication following conservative operation are given in Table VI. Persistent urinary fistula is encountered more frequently following nephrolithotomy (12.5 per cent) and pyelolithotomy (4.1 per cent) than after partial nephrectomy (1 per cent). It has also been observed after nephrectomy by Israel, Joly, and others.

In 1937, the author found 13 cases of fistula (4.3 per cent) in 296 partial nephrectomies for all types of localized diseases of the kidney. Only 2 of 13 cases occurred in the group of 58 partial nephrectomies for localized calculous disease. In the present combined series of 193 cases of partial nephrectomy for localized calculous disease there were only 2 cases of persistent or permanent fistula (1 per cent) and 1 case of temporary fistula (0.5 per cent).

The pathogenesis of persistent urinary fistula following pyelotomy, nephrolithotomy, or partial nephrectomy is well defined. Several etiological factors have been established, viz., (1) failure to secure accurate closure of the affected calyx or pelvis at the time of operation, (2) the presence of gross infection which interferes with proper healing, (3) unnecessarily prolonged drainage of the kidney incision by nephrostomy or pyelostomy tube, (4) failure to determine the permeability of the ureter at operation or by preoperative pyelography, (5) the development of a postoperative obstruction in the affected calyx, pelvis, or ureter due to unrecognized stone, peripelvic or periureteral fibrosis, traumatic infundibular stricture, postoperative malposition of the kidney, or kinking of the ureter, and (6) the presence of some hemostatic agent, i.e., muscle, fascia, fat, or oxycel, which is not readily absorbed and interferes with healing.

The beneficial effect of careful suturing and drainage upon the incidence of fistula following nephrolithotomy is indicated by Tardo's study. He found only 4 fistulas (6 per cent) in 66 nephrolithotomies for aseptic calculi in which the wound was sutured with no drainage. In 138 similar operations treated by drainage with suturing there were only 7 fistulas (5 per cent), whereas in 189 cases treated by drainage without suturing, there were 54 fistulas (30 per cent). The incidence of fistula formation was considerably higher in the infected cases than in the aseptic cases treated by the same methods. In a series of 39 cases of pyelotomy closed with sutures, no fistula occurred, whereas in 152 cases of pyelotomy not sutured, there was 1 permanent fistula and 3 temporary ones.

In 1909 Blum and Ultzman noted 3 permanent and 3 temporary fistulas following 537 pyelolithotomies. Federov reported the incidence of fistula formation following pyelolithotomy as 22 per cent.

This unpleasant complication may be avoided by employing an accurate and painstaking closure of the calyx or pelvis whenever these structures are opened during any renal operation. Its occurrence interferes with proper healing and prolongs the hospitalization period. The local irritation of the lumbar skin by the urine, the expense of repeated dressings, and the restriction of personal, economic, and social activities not infrequently have caused the patient to demand a secondary nephrectomy for relief. In the absence of an obstructive factor, the fistula usually undergoes spontaneous closure after a prolonged period of drainage with a variable amount of damage to kidney function. When the fistula is associated with infection, the affected kidney is likely to undergo total destruction and requires secondary nephrectomy for the complete relief of symptoms. The early recognition and prompt treatment of any pelvic or ureteral obstruction may spare the patient a second operation. When the fistula is caused by some hemostatic agent, which event occurred in the author's Case I following the use of muscle for hemostasis, the elimination of this foreign substance by a sloughing process or by gentle curettage will preserve the integrity of the kidney.

In a stubborn case, delineation of the fistulous tract, its communication with the calyx or pelvis, and its associated perirenal pocketing may be accomplished by intravenous urography or by injecting skiodan (20 per cent) or iodized oil into the fistulous tract. In some cases it may be necessary to reopen the posterior angle of the wound to obtain better drainage. When these measures are unsuccessful, the kidney must be exposed and careful inspection made. If the kidney is sound, resection of the fistulous area with accurate closure of the calycine or pelvic opening will insure a good result. If the kidney shows signs of irreparable damage, nephrectomy is indicated. The use of roentgen irradiation to obtain closure of the fistula is contraindicated because of the danger of irreversible or permanent damage to good functioning renal tissue which may be preserved by other measures.

Purulent fistula and wound infections. These complications were commonly observed following conservative and radical operations for renal lithiasis in the early period of renal surgery. With the introduction of refinements in surgical technique, the use of absorbable suture material, and the recent new chemotherapeutic and antibiotic agents, the incidence of these complications has been markedly reduced. Campbell considers postoperative wound infection and renal necrosis as the most feared complication of partial nephrectomy.

Despite all precautionary measures, minor wound infections are frequently observed following any renal operation. Deep wound infections are more serious in their clinical manifestations and present complex problems in their treatment. Massive wound infections resulting from leakage of infected urine at or following operation may lead to fatal toxemia or septicemia. It is incumbent upon the surgeon to exercise care and caution in avoiding incision into infected tissue or unnecessary opening of the pelvis, and to obtain careful closure of the calyx and pelvis. Despite all precautions, accidental incision of the pelvis or perforation or rupture of the resected infected seg-

ment with spillage may occur. This should be combated by extensive drainage of the perinephritic tissues. Intensive preoperative and postoperative administration of chemotherapeutic drugs (sulfonamides) and antibiotics according to bacteriologic indications are of great value.

The purulent fistula resulting from a superficial or deep wound infection may vary in the amount of drainage, but as treatment is continued the amount of drainage is small and the fistula will close spontaneously after 2 to 4 weeks. The primary source of the wound infection and purulent fistula may be of intrinsic or extrinsic origin. The intrinsic causes include (1) persistence of the intrarenal infection, (2) the presence of a foreign body (drain or sponge) or fragments of calculi which perpetuate the infection, (3) the presence of an unrecognized suppurative process in the perinephric tissue, cortical area, or renal capsule, and (4) the development of infection along the sinus tract created by a nephrostomy tube or drains. The chief extrinsic factor is the accidental contamination of the operative area during the course of operation. Laxity on the part of the surgeon or his operating staff may lead to unpleasant experiences in any renal operation. The same strict aseptic technique and precautions should be employed in every kidney operation as in every other operation.

In the series of 193 partial nephrectomies for localized lithiasis collected by the authors, there were 4 cases (2 per cent) of superficial wound infections and 5 cases (2.5 per cent) of deep wound infections. Since there are no statistical studies available on the incidence of these complications following pyelolithotomy or nephrolithotomy, no comparison can be made.

Other complications may occur after partial nephrectomy as after other renal operations. Such complications are usually the result of faulty technique and may include fecal fistula and postoperative incisional hernia. Fortunately, their occurrence is rare and further discussion is omitted.

Postoperative urinary leakage. Many surgeons consider the immediate postoperative leakage of urine as an unavoidable occurrence in every conservative operation on the kidney. There are some surgeons who regard urinary leakage from the operative wound as a distinct advantage rather than an unnecessary danger. We agree with Joly and Rosving who regard the temporary leakage of urine from the parenchymal or pelvic wound in the first postoperative week as a potential cause of intrarenal and perirenal infection, which serves as an important factor in the recurrence of stone formation. These authors have maintained that the avoidance of urinary leakage is highly desirable, and that temporary urinary drainage, especially in uninfected cases, is likely to be followed by a persistent intrarenal infection of the staphylococcal type which may lead to recurrent stone formation and terminate in gradual destruction of the kidney by the infectious process. They have stressed the importance of careful closure of every incision of the parenchyma and pelvis in the prevention of this complication. They have also emphasized the danger of draining the kidney except in cases in which a severe coccal infection is present before operation.

It is generally agreed that intrarenal infections of the coccal type occur more frequently following the use of a nephrostomy tube in cases of nephrolithotomy and partial nephrectomy. In our personal experience, we have completely eliminated the use of a nephrostomy tube in these two operations. Clinical and experimental studies have clearly established the fact that the cut surface of a kidney in the case of a nephrolithotomy or partial nephrectomy never excretes urine. The leakage of urine from such wounds is the result of the imperfect closure of the incision into a calyx or the pelvis. It is virtually impossible to prevent the escape of urine around a nephrostomy tube while it is *in situ* and after it has been removed. It is our experience that the dressings will remain dry during the entire period of convalescence following partial nephrectomy when careful closure of the wound is employed and a nephrostomy tube is eliminated.

Functional changes following conservative operations. There is a marked divergence of opinion concerning the amount of functional disturbance that may follow each of the various conservative operations for renal lithiasis. The amount of damage is dependent upon the location and extent of the time of incision or excision, the method of suturing, and the presence or absence of infection. The question of postoperative functional impairment entails a consideration of two important factors: (a) the immediate damage resulting from the incision or excision, and (b) the effect of this damage upon renal function.

A certain amount of ischemia and necrosis occurs after every incision into the renal parenchyma. The extent of these changes varies with the caliber of the terminal arterial branches which were cut at the time of incision or occluded by the hemostatic sutures. When small peripheral arteries are severed the area of ischemic necrosis is sharply defined and relatively small (1 to 2 mm.). In the absence of infection this small area is rapidly absorbed and replaced by fibrosis with little or

no impairment of renal function. When a main branch of the renal artery or a large intralobular branch or a large accessory or polar artery is divided, the area of ischemic necrosis may be quite extensive and the absorption of the dead tissue takes place at a slower pace with subsequent proportional decrease in the size and function of the kidney. In the presence of infection, the ischemic and necrotic tissues serve as a perfect culture medium for the growth of pathogenic organisms. As the infection spreads into each side of the incision, progressive destruction of the functioning renal elements ensues. If the infection continues untreated or unabated it may lead to total destruction of the kidney.

The pathological changes described serve to explain the varying degree of functional impairment observed after nephrolithotomy, nephrostomy, and partial nephrectomy. Thus, each of these operations may be followed by little or no functional impairment, or by a considerable loss of tissue and function.

The role of compensatory hypertrophy of the remaining portion of the kidney and of the opposite kidney following conservative operations has not been clearly defined. Our knowledge of this subject is confined to functional studies before and after operation. It is generally agreed that in the absence of infection a compensatory hypertrophy will occur in the remaining portion of the kidney, provided the amount of renal tissue destroyed by the incision is not too great, i.e., removal of more than one-half of one kidney. In the latter type of extensive destruction of one kidney, a compensatory hypertrophy will develop in the opposite kidney. The presence of an infection in the kidney following nephrolithotomy or in the remaining segment following partial nephrectomy may seriously impair or prevent the development of compensatory hypertrophy in the affected kidney or remaining segment. The effect of the various types of hemostatic sutures upon renal function is discussed under operative technique.

Our clinical experience with the effect of partial nephrectomy upon renal function is in accord with the findings of Mathe, Engle, Twinem, Yunck and Forsythe, and others. We have observed little or no postoperative impairment of renal function (as determined by differential phenolsulfonphthalein studies) in the remaining portion of kidney after the removal of one pole, amounting to one-quarter to one-third of the total substance of the affected kidney as determined by linear measurement and actual weight of the removed segment. In our personal cases postoperative phenolsulfonphthalein excretion studies have regularly shown a gratifying improvement in renal function of the operative kidney. The beneficial change may be caused by the removal of the infected tissue and the relief of the remaining portion from toxic results.

In a previous article the author has discussed the question of how much renal tissue is necessary to maintain life. The amount of renal tissue necessary to maintain life differs slightly in the various experimental animals; dogs and cats require 25 per cent of their total renal tissue, rats one-sixth (16.6 per cent) of their total renal tissue, rabbits 40 per cent, and goats from 10 to 15 per cent. These findings are not applicable to man as the operations were performed on healthy animals while in man operation is restricted to the diseased kidney. However, a careful study of the clinical reports of (a) unilateral partial nephrectomy before or after removal of the opposite kidney, (b) partial nephrectomy of the congenital solitary kidney, (c) simultaneous partial nephrectomy of one kidney and removal of the other kidney, and (d) extensive bilateral partial nephrectomy permits the following conclusions:

1. Extensive operative reduction of the total renal mass, i.e., removal of one kidney and from one-third to one-half of the other kidney may be successfully employed in the treatment of severe bilateral renal disease.

2. The minimum amount of renal substances necessary to sustain life adequately is one-fourth of the total renal substance, or one-half of one kidney.

3. Removal of two-thirds of the total renal substance, i.e., removal of one kidney and one-third of the other kidney, was successfully accomplished in 10 cases in the early series of 296 partial nephrectomies collected by the author in 1937.

4. It is advisable to wait at least from 4 to 8 weeks between operations in cases entailing partial nephrectomy of one kidney and removal of the other, or bilateral partial nephrectomy in order to permit the development of a compensatory hypertrophy in the partially nephrectomized kidney and to minimize or obviate the danger of postoperative shock or uremia.

5. No hard or fast rules can be laid down concerning which kidney should be operated upon first in cases of severe bilateral disease. The surgeon must be guided by the general condition of the patient, the extent and severity of the disease process in each kidney, and the functional capacity of each kidney. The presence of a severely infected nonfunctioning kidney may require removal of this kidney before a partial nephrectomy of the other kidney in order to decrease the excre-

tory burden of the better kidney and to permit the development of a compensatory hypertrophy in this kidney. In an occasional case with bilateral involvement, it may be advisable to perform the partial nephrectomy on the better or least affected kidney first in order to take advantage of whatever secretory function is possessed by the other kidney which is more seriously damaged and may require nephrectomy. This procedure was successfully employed in 4 of the 193 cases reviewed by the authors.

Pyelolithotomy performed in suitable cases is rarely followed by any impairment of renal function or permanent damage to the kidney. The development of such changes following pyelolithotomy may be the result of an injury to the retropelvic artery or an injury to the calycine lining or adjacent blood vessels during extraction of a calycine stone. The retropelvic artery is a branch of the main renal artery and usually lies close to or under the hilar portion of the parenchyma covering the pelvis. The artery passes across the pelvis from above downward and gives off several small branches to the adjacent kidney in its upper portion. When this artery is injured in its lower portion, little damage to kidney function develops. This portion of the retropelvic artery may be damaged or severed when the usual posterior pyelotomy incision is carried up into the intrarenal portion of the pelvis or when the pyelotomy incision is extended into the lower portion of the kidney parenchyma in the direction of the lower major calyx as in the procedure of enlarged pyelotomy advocated by Marion, Eisendrath, and Deming. The bleeding from this portion of the retropelvic artery can usually be controlled by simple ligation or suturing a piece of fat or muscle over the bleeding point. When the retropelvic artery is injured in its upper portion, it may lead to serious damage to the posterior portion of the kidney. In rare instances an injury to an intrarenal type of retropelvic artery may lead to serious hemorrhage, and the search for the bleeding point as well as the efforts to control the bleeding may be unsuccessful. Immediate nephrectomy is necessary to prevent a fatality.

Injury to the calycine lining and the underlying blood vessels and tissues may be caused by (a) digital exploration of the pelvis or calyces, (b) an attempt to dilate the narrow infundibular portion of the calyx with a finger or stone forceps, and (c) the extraction of a large branch of a coralliform calculus or a large spiculated calycine calculus. In either instance, the delicate calycine lining and adjacent tissues may be torn but in most instances they heal promptly. In the presence of infection, serious sequelae may develop, i.e., tissue necrosis, thrombosis of the adjacent blood vessels, infarction of tissue, and delayed hemorrhage. In such cases, the surgeon should exercise discretion and caution by removing the large irregular branched calculus through a clean cortical incision or by employing partial nephrectomy in the case of a large calycine stone with a narrow infundibulum.

We have been unable to find any reports of hypertension following partial nephrectomy for localized calculous disease. Campbell was unable to demonstrate any notable changes in the blood pressure following partial nephrectomy. On the other hand, hypertension has been observed following extensive nephrolithotomy, particularly in infected cases. The hypertension, in all probability, is not caused by the nephrotomy incision per se but rather is the result of a persistent infection of the renal parenchyma perpetrated or aggravated by the nephrolithotomy.

Kahle and Schenken have reported the only case of renal aneurysm which developed after partial nephrectomy. The aneurysm was responsible for severe hemorrhage which was fatal. The cause of the aneurysm was undetermined but was probably associated with the type of hemostatic sutures employed.

Recurrence of stone formation. The time has come for urologists to revise our rather optimistic, although unwarranted, views as to the results of conservative operations for renal lithiasis. On the whole, urologists are cognizant of the grave danger of progressive destruction of the kidney by a calculus and are aware that the risk of most operations for renal lithiasis is not too great in selected cases. However, few urologists realize that the probability of recurrent stone formation is high following pyelolithotomy and nephrolithotomy. The urological literature does not contain many statistical studies of the incidence of recurrent stone formation following conservative and radical operations for lithiasis. This may be due to the fact that either the subject is unpopular because of the difficult task of compiling and checking accurate data, or else the personal disappointments have discouraged such investigations.

The impartial observer will be forcibly impressed by the statistical reports of the incidence of recurrent stone formation collected by the authors in Table VII. This table not only presents the results obtained in large collected series of operations performed in well known clinics but also in small series performed by different surgeons in various parts of the world. It also presents the results obtained in the early and recent periods of renal surgery.

Some observers may raise an objection to a comparative study of the incidence of stone formation following pyelolithotomy and nephrolithotomy and following partial nephrectomy on the basis that the cases in the latter group are too few for comparison. However, this objection does not appear to be too valid or entirely justifiable in view of the fact that the statistical study of recurrence of stone following partial nephrectomy represents the total number of cases reported to date and covers the same periods of conservative and radical surgery for renal lithiasis. Undoubtedly it will prove a great surprise to most urologists to learn that the incidence of recurrence is lowest following partial nephrectomy, higher following pyelolithotomy, and highest following nephrolithotomy.

From an analysis of Table VII, we learn that the incidence of recurrent stone after pyelolithotomy was 10.9 per cent, after nephrolithotomy 15 per cent, and after nephropyelolithotomy 24.7 per cent. The incidence of recurrence following partial nephrectomy was only 2.0 per cent. Gottstein observed that the incidence of recurrence following pyelolithotomy and nephrolithotomy in infected cases (i.e., 10.2 per cent and 22.2 per cent, respectively) was considerably higher than in aseptic cases (i.e., 4.5 per cent and 8.1 per cent, respectively).

Recurrence of stone following operation on the kidney may be classified as (a) true—when an entirely new stone develops following the complete removal of the original stone or stones, and (b) false or residual—when a fragment of the original stone remains or one or more stones have been overlooked at operation. The real incidence of recurrence must be based on the combined true and residual recurrences. In the early statistical reports, the recurrence was based on the clinical history of the passage of a stone after operation or on the finding of a stone at a second operation. The recent studies are more accurate as they are based on roentgenographic findings at the end of operation or before discharge from the hospital. Roentgenographic examination provides the most important method of differentiating between true and residual recurrences.

One cannot emphasize too strongly the inestimable value of routine roentgenographic or fluoroscopic examination of the exposed kidney at every operation for renal lithiasis. The discovery of retained fragments or unsuspected calculi enables the surgeon to remove them and prevent a residual recurrence. When renal roentgenography or fluoroscopy is not performed at operation for technical or economic reasons, the examination should be performed before the patient is discharged from the hospital. The importance and value of such examination is indicated by the findings of Barney, who observed the passage of a stone during convalescence in 12 of 35 patients submitting to pyelolithotomy and the presence of a stone shadow in 9 of a second series of 20 operative patients who were subjected to roentgenographic examination before discharge from the hospital. The value of roentgenographic and fluoroscopic examination at operation in lowering the incidence of residual recurrence is substantiated by the report of Braasch and Foulds. These investigators observed a residual recurrence as determined by roentgen examination before discharge in only 31 patients in a series of 685 operative patients in whom these operative control measures were employed.

In a recent study, Hellstrom found a combined recurrence of stone formation in 86 (24.7 per cent) of 348 patients operated upon for renal lithiasis. In 27 cases, fragments of calculi were overlooked or left behind. In 29 cases, true recurrence of new calculi was observed. In 13 cases the recurrence of calculi was bilateral in nature.

There are several factors which may influence the postoperative recurrence of stone, viz., (1) age of the patient, (2) type of operation, (3) local or general tendency to stone formation, (4) presence of renal infection, (5) postoperative stasis resulting from obstruction of the calyx, pelvis, or ureter, and (6) chemical composition, size, number, and location of the calculi. Our studies indicate that the most important single factor in recurrent stone formation is the development or persistence of renal infection. In view of the role that the other factors may play, a brief discussion of each factor is presented.

1. *Age.* The tendency toward stone formation is relatively high in people under the age of 35 years and relatively low in those over 40 years. Some authors have stressed a "stone-forming age period" between 25 and 35 years, but because of the variability of the age incidence and the multiplicity of etiological factors we deem it inadvisable to fix an arbitrary age period for stone formation.

2. *Type of operation.* The choice of operation must be based on a comprehensive preoperative study of both kidneys, which should include functional tests of each kidney, pyelographic studies, and bacteriologic cultures. In an occasional case, the final choice must be made at operation when the anatomical and pathological findings may alter the preoperative plans. The individual skill and ingenuity of the surgeon may influence the development of postoperative complications and

the subsequent recurrence of stone formation. The exercise of caution in placing the parenchymal or pelvic incisions, and of gentleness in removing the calculi is rewarded by a minimum of damage to the kidney and complete removal of the calculi. The use of suction or irrigation for intrapelvic coagulum after the method of Dees in appropriate cases may insure the removal of minute fragments or small calculi otherwise likely to be overlooked or left behind. The value of routine roentgenographic or fluoroscopic examination at the time of operation as a control measure in every conservative operation for stone has been previously emphasized. The surgeon should not place too much reliance on digital palpation of the pelvis or calyx to detect stones because not infrequently small calculi are inaccessible to the finger or are surrounded by small blood clots or debris which interferes with their recognition by the sense of touch.

3. *Local and general tendency toward stone formation.* It is generally agreed that stone formation may involve either or both of the following etiological factors: (a) a general metabolic or physiological factor, and (b) a localizing factor—localized calcareous papillitis. Hryntschak, Hellstrom, Fedorov, Twinem, and others have stressed the influence of local conditions on the recurrence of stone formation following operation. In support of this contention is the fact that primary bilateral calculi occur in from only 10 to 20 per cent of the cases and following the removal of a stone-bearing kidney whose opposite mate is free of calculi; the recurrence or formation of calculi in the opposite kidney occurs in from only 2 to 5 per cent.

4. *Renal infection.* The role of renal infection in the development of recurrent stone formation has not received proper recognition by urologists. The studies of Brongersma, Tardo, Oppenheimer, Twinem, and others have shown that the prognosis is good from the standpoint of recurrence and renal function if the primary stone is aseptic or if the renal infection is cleared up entirely following operation. Renal infection which persists untreated after operation eventually leads to the gradual destruction of the kidney with or without the recurrence of stone. It is well known that a stone per se may destroy a kidney, but a stone plus infection works more rapidly than a stone or infection alone.

The character of the infecting organism plays an important role in tenacity and amenability of the infection and the rate of recurrent stone formation. Persistent or postoperative infection due to urea-splitting organisms, i.e., the Bacillus proteus or staphylococcus, may lead to secondary phosphatic calculi within a relatively short time after operation, whereas the Bacillus coli and other organisms growing in an acid urine are less likely to form secondary stones during the process of destruction of the kidney.

In a study of 200 cases of recurrent renal calculi, Higgins found a coexisting renal infection in 81.5 per cent and sterile urine in 18.4 per cent. The predominating organism was the staphylococcus albus and next was the Bacillus proteus.

Hellstrom has demonstrated the powerful influence of persistent staphylococcal infection in the formation of secondary phosphatic calculi. This work has been corroborated by Hryntschak who performed microscopic examination in 43 cases of secondary phosphatic calculi and found staphylococci in 37 (86 per cent). In a study of 109 cases of recurrent stone, Rosving found that 71 per cent presented primary or secondary infection with urea-splitting organisms. The most common organisms encountered in the 10 patients with the most frequent recurrence of stone were the Bacillus proteus (6 cases), staphylococcus albus (2 cases), Bacillus lactus aerogenes (1 case), and Bacillus proteus combined with Bacillus fluorescens (1 case). Schneider and Coudouens examined 51 cases of recurrent stone and observed that the Bacillus coli is conducive to the formation of calcium oxalate stones and that the staphylococcus favors the formation of uratic calculi. Fisch also noted that the Bacillus coli favored calcium oxalate stones. Illyes maintained that the Bacillus coli usually gives rise to large branched calculi while the staphylococcus favors the formation of small phosphatic calculi which cause more renal destruction. He also stressed the fact that not infrequently the Bacillus coli may be superimposed and crowd out the coccus. Higgins found that 9 per cent of the bacilli and 18 per cent of the staphylococci in his cases of recurrent calculi were urea-splitting in nature.

The persistence of infection in the operative kidney may serve as the source of infection in the opposite kidney. The resultant bilateral infection and stone formation naturally carries a more serious prognosis than unilateral involvement. Consequently, the development or persistence of infection following operation demands intensive treatment and reinvestigation when they fail to respond to treatment. No patient with stone should be considered cured until the accompanying infection is completely eradicated. Infection rarely responds to treatment in the presence of a stone. The introduction of new chemotherapeutic drugs (sulfonamides) and the antibiotics (penicil-

lin, streptomycin, aureomycin, chloromycetin) provides us with effective weapons to eradicate those stubborn infections which were resistant to the drug therapy of 20 years ago.

5. *Postoperative stasis.* The role of stasis or obstruction in the formation and recurrence of stone has been clearly established. At times it may be difficult to determine whether stasis and infection preceded or followed stone formation or recurrence. It is well recognized that the removal of a calculus by a conservative operation is not sufficient to effect a permanent cure when correction of the obstructive factor responsible for the primary stone formation is neglected or overlooked. Too frequently the result of a perfectly performed pyelolithotomy or nephrolithotomy is marred by a persistent ureteral or ureteropelvic obstruction, a "dysuric" or angulated calyx with faulty drainage, or the failure to ensure good postoperative urinary drainage from the pelvis or calyx by correct replacement or suspension of the kidney.

In a study of 5 cases of recurrent stone formation following 17 operations for renal lithiasis, Coidan studied the pyelocalycine contractions by pyeloscopy and found no recurrence when this mechanism was normal. He observed that the absence of this mechanism favored retention, stasis, and stone formation, and that it was caused by permanent dilatation of the pyelocalycine structures. He also stressed the role of infection in producing alterations in the contractile mechanism.

Preoperative and postoperative pelvic stasis or caliectasis are important predisposing factors in stone formation, not only because of the precipitation of crystalloids and colloids in stagnant urine but also because of the frequent development of infection within the stagnant area. Another effect of stasis and infection is the predisposition to alter the *p*H of the urine to the alkaline side, which favors the development of phosphatic calculi, the chief type of recurrent calculi.

It is quite obvious that when a calculus forms within a dysuric or angulated or obstructed calyx, the mere removal of the calculus by pyelolithotomy or nephrolithotomy is ineffective in producing a permanent cure. Complete removal of the affected calyx and stone by partial nephrectomy provides the only safe and sure measure to produce a cure by removing both the cause and result of primary calycine stone. This is true particularly of calculi in the dependent inferior calyx.

6. *Chemical composition, size, number, and location of the calculi.* The structure and location of the stone may play a definite role in recurrent stone formation. Solitary renal calculi are more likely to be composed of calcium oxalate whereas multiple calculi are more prone to be composed of phosphates. Cifuentes studied 31 oxalate stones and found that 24 were solitary and 7 multiple, while in a series of 166 phosphatic stones, 67 were solitary and 99 multiple.

Braasch and Foulds observed the recurrence of stone in 55 (11.77 per cent) of 467 cases of solitary stones, in 11 (12.94 per cent) of 85 cases of branched stones, in 33 (8.9 per cent) of 368 cases of multiple stones, in 70 (13.48 per cent) of 519 cases of small stones, and in 29 (6.66 per cent) of 300 cases of large stones. It was rather surprising and contrary to expectation to note that the recurrence was greater following the removal of a single stone than after removal of multiple stones. Twinem's findings are more consistent with the prevailing opinion of urologists consulted on this question. He reviewed 102 pyelotomies and found that the incidence of recurrence was 18.3 per cent in 82 cases of solitary calculi as compared to 30 per cent in the cases of multiple calculi. A similar trend was observed in 100 nephrolithotomies in which the recurrence was 23.7 per cent in the cases of solitary stone as compared to 36.9 per cent in the cases of multiple calculi. Oppenheimer reported a recurrence in 12 per cent of the cases of solitary stone and of 23.5 per cent of multiple or dendritic calculi treated by pyelolithotomy.

The frequent location of calculi within the calyces which may be associated with intrinsic or extrinsic obstructive changes may play a definite role in the recurrence of calycine stones. Twinem studied 283 cases of renal lithiasis and found calculi in the calyces (excluding the coralliform calculi) in 136 cases. The calculi were in the lower calyx in 89 cases, in the upper calyx in 27 cases, in the middle calyx in 9 cases, and in all of the calyces in 13 cases. In the remaining 147 cases, the calculi were found in the pelvis alone in 93 cases, at the ureteropelvic junction in 10 cases, and in the parenchyma in 3 cases; in 41 cases they were coralliform (branched).

Braasch and Foulds observed that the relative incidence of recurrence in cases of calculi in the parenchyma, calyces, and pelvis was essentially equal. There were 14 recurrences (12.6 per cent) in 111 cases of calycine calculi, 14 recurrences (10.3 per cent) in 135 cases of parenchymal calculi, and 75 recurrences (11.6 per cent) in 644 cases of pelvic calculi. As previously indicated, most parenchymal stones can be classified as calycine calculi, which would give a total of 28 recurrences (11.3 per cent) in 246 cases of calycine and cortical calculi.

The chemical composition of the calculi may affect the rate of recurrence by virtue of the role

played by infection in the formation of secondary phosphatic calculi. It is interesting to note that the true recurrence rate for all conservative operations in cases of primary stone (calcium oxalate and calcium phosphate) was only 8.1 per cent as compared with 28.3 per cent in cases of secondary stones (mixed phosphates of the alkaline earth salts). These findings were corroborated by Twinem who observed a recurrence in 11 cases (14.8 per cent) of 74 cases of calcium oxalate stones, in 28 cases (35.4 per cent) of the 79 cases of secondary mixed phosphate calculi, in 2 cases (28.5 per cent) of 7 cases of uric acid calculi, and in all 3 cases (100 per cent) of cystine calculi.

Other factors influencing recurrent stone formation. Many writers have repeatedly stressed the fact that the operative removal of a renal calculus or calculi is but one phase in the management of this disease. A familiarity with all factors entering into the cause of stone formation is essential to the correct management of all such cases. A proper and adequate preoperative and postoperative regimen is essential to the successful outcome of any operation for renal lithiasis as well as for the prevention of recurrent stone formation. These measures are applicable to all conservative and radical operations for renal calculi:

REGIMEN FOR THE PREVENTION OF RECURRENCE OF STONES

A. Adequate preoperative study and treatment
   1. Comprehensive urologic study
   2. Control of infection
   3. Combating of anemia, dehydration, and acidosis
B. Proper postoperative care
   1. Treatment and prevention of urinary infection
   2. Adequate fluid intake and control of the *p*H of the urine
   3. Avoidance of stasis
      a. Frequent movement of the patient
      b. Early ambulatory care
      c. Cystoscopic treatment
   4. Dietary control
      a. Adequate vitamin A
      b. Acid or alkaline ash diet
      c. Correction of metabolic disorders
      d. Limitation of calcium
   5. Elimination of all foci of infection
   6. Postoperative examination
      a. Roentgenographic study
      b. Urine cultures
      c. Blood chemistry
      d. Phthalein studies
      e. Cystoscopy and pyelography

Preoperative care. The value of a comprehensive physical examination including a complete urological study in every case of renal lithiasis is recognized by every urologist. This type of study enables the urologist to decide upon the type of treatment to be employed, to determine the presence of contraindications to the selected type of treatment, and to adopt various medical measures which may aid in the elimination of all constitutional and local factors predisposing to recurrent stone formation.

One of the most important steps in the preparation of the patient for operation is the control of urinary infection by appropriate sulfonamide or antibiotic therapy, according to the proper bacteriological indications. The frequent use of transfusions in the treatment of anemia is a valuable supportive measure. Dehydration and acidosis are combated by the intensive parenteral administration of saline, glucose, or lactate solutions.

Postoperative care. It has been the routine practice in our clinic to employ chemotherapy after every operation for renal lithiasis. In noninfected cases, sulfathiazole and sulfadiazine, each gm. 0.25 q.4 hr., is administered for 4 days to prevent the development of a urinary infection. Chemotherapy is always resumed immediately after operation in infected cases which have responded favorably to preoperative therapy. Repeated examinations and cultures of the urine are made during the postoperative stay to determine the presence of infection. A minimum fluid intake of 3,000 c.c. is advisable to provide good urinary excretion and drainage. The intravenous administration of fluid is begun at operation and continued for the first 2 postoperative days. After this time, fluids are taken by mouth. As soon as the chemical composition of the stone is determined and the presence or absence of infection is confirmed, appropriate measures are taken to control the *p*H of the urine with suitable acidifying agents (ammonium chloride or nitrate, dilute hydrochloric acid) or alkalies (sodium bicarbonate).

Every effort is made by the resident doctor and nursing staffs to avoid the harmful effects of prolonged stasis. Stasis in the upper urinary tract is conducive to a shifting *p*H of the urine to the alkaline side which may favor stone formation or recurrence. The patients are encouraged early to shift their position in bed at frequent and regular intervals. To prevent the harmful effects of recumbency, our patients are gotten out of bed on the second or third day after operation.

The value of a correct dietary regime in renal lithiasis is rarely appreciated by the patient or the

family physician. Too much reliance cannot be placed on history taking to determine the presence of dietary insufficiency. Ezickson, Higgins, and others have demonstrated vitamin A deficiency in a high percentage of patients suffering from renal lithiasis by utilizing biophotometric studies. Higgins obtained a positive test for vitamin A deficiency in 70 per cent of the patients with primary renal lithiasis and in 48 per cent of those with recurrent calculi.

Large doses of vitamin A should be prescribed routinely in every case of stone as a prophylactic measure. The beneficial effects of this type of therapy upon the epithelial structures of the kidney have been clearly established but are not generally recognized by physicians. Appropriate acid or alkaline ash diets are given as soon as food can be taken. Higgins stated that a reduction in recurrent stone formation from 16.4 per cent to 4.9 per cent followed the addition of a high vitamin A, acid ash or alkaline ash diet to other postoperative measures. Appropriate diet lists are compiled by the hospital dieticians for the patients' use after discharge from the hospital. Whenever metabolic disorders are discovered, i.e., gout, uraturia, phosphaturia, oxaluria, cystinuria, appropriate medication and diet are prescribed. In cases of calcium oxalate or calcium phosphate lithiasis, it is advisable to study the calcium intake and excretion, and limit the calcium intake by dietary control.

The role of foci of infection upon stone formation and recurrence is also not generally appreciated by the patient or referring physician. It is imperative that a careful search be made for foci of infection in the teeth, tonsils, sinuses, cervix, and prostate gland, and that complete eradication be accomplished. Faulty elimination and constipation should be corrected as these factors may play a role in the formation or recurrence of calcium oxalate and uric acid calculi.

One cannot emphasize too strongly the value of frequent postoperative examinations in the prevention of stone formation or recurrence. It has been our practice to insist upon a routine plain roentgenogram before discharge from the hospital and at 3 months intervals thereafter. The patients are requested to have intravenous urography performed at intervals of 6 months. Chemical and bacteriologic examinations of the urine are made at regular intervals to rule out infections. We also advise routine blood chemistry studies, i.e., for urea or nonprotein nitrogen in cases of suspected renal impairment or insufficiency, and for serum phosphate and calcium in cases of hypercalcemia suggestive of hyperparathyroid disease or bone diseases. Functional tests with phthalein are done routinely following operation for renal lithiasis to detect the presence or development of changes in renal function. The importance of postoperative cystoscopic studies in the diagnosis and treatment of obstructions and infections of the ureter, ureteropelvic junction, and pelvis is self evident.

Operative technique for partial nephrectomy. We are firmly convinced that a successful partial nephrectomy demands an orderly plan of operation, as will be outlined. Insufficient attention to details may lead to unpleasant complications. In an occasional case there may exist certain anatomical and pathological changes, i.e., an abnormal blood supply, or abnormal fixation of the kidney due to congenital maldevelopment or perinephritis, which may interfere with the perfect execution of one or more steps in this operative plan.

The operative plan.

1. Proper surgical approach (lumbar route)
2. Adequate exposure and mobilization of the kidney
3. (a) Careful exposure of the blood supply of the entire kidney, (b) isolation of the blood supply of the affected area whenever possible, and (c) temporary compression of the vascular pedicle if necessary
4. Removal of the affected portion of the kidney
   (a) Incision and retraction of the capsule
   (b) Incision through healthy tissue
5. Accurate closure of the kidney wound
6. Nephropexy and drainage of the renal bed.

The significance of the first two steps is obvious and requires no further comment. The influence of the latter four steps upon the successful operative result is not fully appreciated by some surgeons. These phases of the operation merit further discussion.

Blood supply of the entire kidney and affected area. During exposure and mobilization of the kidney, it is imperative to avoid damaging the vascular supply of the kidney. A careful search for abnormal cortical or polar blood vessels should be made. A thorough exposure of the renal pedicle is necessary to determine the distribution of the renal artery and vein. Meticulous dissection in this area may reveal the branch of the renal artery and vein which supplies the area of renal tissue to be removed. Temporary compression of these vessels results in a purplish discoloration of the area supplied and enables the surgeon to determine the exact amount of tissue to be removed. Ligation and division of these vessels prior to removal of the affected area provides a bloodless

operative field, prevents primary or secondary hemorrhage, and eliminates the use of temporary compression of the entire vascular pedicle during the operation.

When the nutrient vessels of the affected renal segment cannot be isolated by dissection because of the presence of anatomical or pathological changes, the actual removal of the affected segment can be performed with a minimum of bleeding during operation by employing temporary compression of the renal pedicle. This may be accomplished in several ways, i.e., digital compression by an assistant, or with a tourniquet of rubber tubing, rubber bands or tape around the pedicle, rubber-shod pedicle clamps, or a Stellwagon pedicle clamp. We prefer to use the rubber-shod pedicle clamp. This clamp is never left in place continuously for more than 20 minutes in order to avoid permanent renal damage from ischemia. It is advisable to open the clamp for a few seconds at intervals of 5 or 10 minutes to prevent clotting or thrombosis of the blood vessels and to insure the integrity of the vessels. In our experience digital compression of the parenchyma adjacent to the line of excision by an assistant has proved unsatisfactory and interferes with the execution of the operation.

Many authors prefer to decapsulate the portion of the kidney to be removed and utilize the capsule in the closure of the wound. This procedure is particularly advantageous when employing the wedge-shaped or cuneiform type of excision. Lichtenberg and Papin have employed a circular suture of the capsule over the cut surface, while other surgeons use interrupted sutures of No. 00 nonchromized catgut in single or double layers, with or without imbrication of the two leaves of the capsule. Decapsulation and reflection of the capsule area may also be used when the affected renal tissue is removed by transverse excision. One great advantage of preserving the capsule over the renal tissue adjacent to the line of excision is that the replaced capsule serves to prevent the hemostatic sutures from cutting into the parenchyma and thus eliminates the use of pieces of fat in underpinning these hemostatic sutures as advocated by Beer and Hagenbach.

The utilization of the reflected capsule not only aids in the closure of the wound by holding the sutures in place but also serves to hold the hemostatic agent (fat, oxycel, fibrin foam) within the wound to seal over the raw surfaces and thus check late oozing. However, the authors have performed several successful partial nephrectomies in which they have not reflected the capsule from the affected area and have depended entirely on a simple cobbler stitch closure for hemostasis. It is not always possible or advisable to reflect the capsule, especially when the cortical portion of the affected area is very thin and the seat of acute or chronic abscess formation.

The incision for removal of the localized disease area should always be made through healthy tissue. The incision is preferably made with a scalpel rather than an electrocoagulating instrument. Yunck and Forsythe studied the histological changes in 13 days and found the scalpel to be definitely superior to the high frequency cutting current. When the parenchymal incisions were made with a scalpel, healing was prompt and complete at the end of 14 days and normal parenchyma was found within 2 mm. of the operative scar. When the high frequency current was used, they observed marked local sepsis with no evidence of healing. We believe that it is more than mere coincidence that the only case of secondary hemorrhage encountered by the authors followed the use of the electrocoagulating instrument; undoubtedly it had a deleterious and destructive effect upon the infected tissue adjacent to the line of excision, and the subsequent sloughing caused the delayed bleeding.

Various methods and sutures have been employed in the closure of the renal wound. Herbst and Polkey and others have made experimental studies of the various methods of closure of the wound in partial nephrectomy and found that the best results were obtained when the simple continuous through-and-through suture of Tuffier was used after the reflected capsule was replaced. They observed that mattress sutures were highly destructive to the parenchyma and produced a maximum amount of atrophy. There are no experimental studies on the effect of the cobbler stitch, which acts more or less like a continuous mattress suture. The suture material is usually No. 1 plain or chromicized catgut of the atraumatic type (straight needle with the catgut fused into the head of the needle). Some surgeons prefer to grease these needles with sterile olive oil or vaseline. Others have employed to advantage the special atraumatic hemostatic needle designed by Dees. Not infrequently, the larger bleeding vessels in the cut surfaces of the wound can be grasped with small mosquito forceps and ligated.

One of the most important points in the closure of the renal wound is the immediate suture of the opened calyx or pelvis with a continuous No. 000 or No. 0000 plain catgut suture. This prevents the development of a permanent urinary fistula. After this has been accomplished, the renal wound can be closed according to the surgeon's preference.

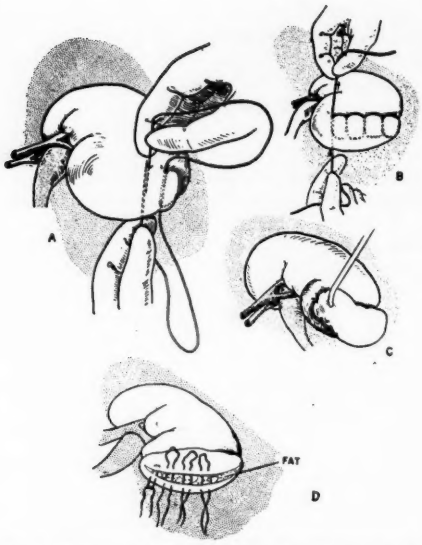

Fig. 1. Diagrammatic sketch showing placement of cobbler type of stitch for renal compression. *A*, First stitch has been placed. Second is being started by inserting needles from opposite surfaces of kidney. Catgut suture with double end straight, atraumatic needles is employed. *B*, As suture progresses across kidney, compression is accomplished by assistant's maintaining traction. *C*, Shows suture completed and tied on opposite side of kidney. *D*, Mattress suture closure of capsule after wedge-shaped excision of tissue. A piece of fat is placed over the cut surface of the kidney before suture of the capsule. (After Engel.)

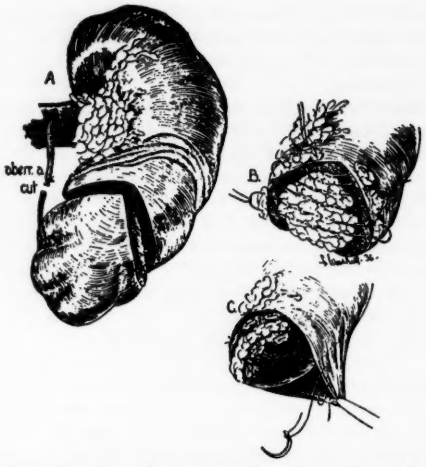

Fig. 2. Drawing of the wedge-shaped resection of lower fifth of the left kidney for localized calculous pyonephrosis. *A*, The aberrant artery supplying the lower pole of the kidney has been ligated and the capsule retracted before the wedge-shaped excision is made. *B*, The operative defect is closed by placing a pad of fat in the wound and approximating the edges of the incision with mattress sutures underpinned with fat (Beer-Hagenbach method). *C*, The retracted capsule is drawn over the incision and closed with a continuous No. oo nonchromicized suture.

Several methods have been advocated by different authors:

1. The cobbler stitch placed beyond the line of excision (Fig. 1).

2. Two or more layers, which include a deep peripelvic layer to control bleeding from the peripelvic and pericalycine vessels, and one or more superficial layers to control cortical and medullary bleeding points. The latter layers have a tendency to tear through the parenchyma.

3. Interrupted mattress sutures underpinned with small pieces of subcutaneous or perinephritic fat in a single or double layer (Fig. 2).

4. The continuous through-and-through hemostatic suture of Tuffier (Fig. 3).

5. Flat ribbon gut sutures taken through the capsule after the method of Lowsley.

The authors have employed each method with success. In the early cases the closure was usually made in two layers. In some of the later cases the closure was made with a continuous through-and-through suture after the method of Tuffier. In the more recent cases we have utilized the cobbler stitch, placed before transverse excision of the affected tissue, and covered the exposed surface with gelfoam or oxycel anchored by the capsule or superficial catgut (No. oo) sutures. This method appeared to simplify the operation, saved time, and checked hemorrhage effectively. In each of the methods a piece of fat, fibrin foam (gelfoam), or oxycel muscle may be placed in the wound or on top of the wound and anchored by the deep sutures or superficial catgut sutures, or held in place by suturing the reflected leaves of the capsule. When interrupted mattress sutures are used, the ends of the sutures on opposite sides of the wound may be left long and used to anchor the pad of fat, fibrin foam, or oxycel within the wound. This method is particularly efficacious when a transverse excision is employed. The sutured wound must be carefully examined for bleeding following the release or removal of the rubber-shod clamp on the pedicle. The presence of bleeding following this maneuver can easily be controlled by interrupted mattress sutures.

After the renal wound has been closed, roentgen examination of the exposed kidney should be made routinely before it is returned to its bed. This procedure is a check upon the complete re-

moval of all calculi and calcareous particles. The time consumed by this procedure is repaid by the prevention of false or residual recurrent stone formation.

Following the repair of the renal wound, it is important to replace the remaining portion of the kidney in a high position in order to insure good postoperative drainage and prevent postoperative torsion or lateral displacement. The authors have used the Deming method of nephropexy which entails plication of the perinephritic fat with a circular stitch of which the ends are anchored in the quadratus lumborum muscle at the level of the eleventh intercostal space. This method avoids the use of intrarenal or subcapsular sutures. One may also employ a modified Kelly or Mathe nephropexy utilizing triangular capsular sutures at the upper and lower portion of the posterior surface of the remaining kidney.

There is no necessity for pyelostomy, nephrostomy, or intrarenal drainage of the renal wound except in rare cases complicated by severe intrarenal or intrapelvic infection requiring such drainage. When this type of drainage is necessary, it would appear advisable and practical to use a No. 18 F. rubber catheter rather than a Malecot or DePezzar catheter, and to insert the catheter through the parenchyma into the pelvis at some distance from the operative site, i.e., at the lower or middle third of the kidney, in order to obtain dependent drainage. We have not employed this type of drainage in any of our cases despite the presence of intrarenal infection in at least 3 cases. We are convinced that the use of a nephrostomy or pyelostomy tube increases the hazard of postoperative urinary or purulent fistula, delayed secondary hemorrhage, and intrarenal infection.

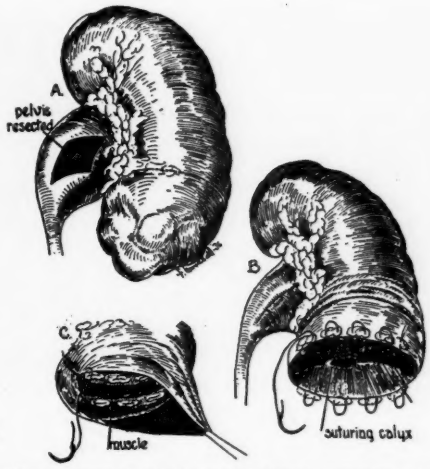

Fig. 3. Drawing of the wedge-shaped resection of the lower third of the right kidney for localized calculous pyonephrosis. *A*, The dotted line represents the upper limit of the resected tissue. A diamond-shaped portion of the dilated pelvis was removed to correct the hydronephrosis. *B*, Operative defect resulting from the wedge-shaped excision of renal tissue. The severed lower major calyx is closed with a continuous suture of No. 00 nonchromicized catgut. The edges of the wound are approximated by a continuous through-and-through suture of the number 2 nonchromicized catgut underpinned with fat. *C*, A piece of muscle is placed in the wound before approximation of the edges of the wound. The capsule is closed with a continuous No. 00 nonchromicized suture.

Several cases of hemorrhage following the removal of this type of drainage tube have been reported.

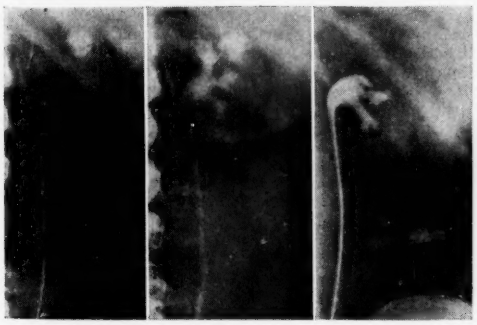

Fig. 4. Case 1. *a*, A preoperative film showing a cluster of calculi in the upper pole of the left kidney. *b*, A preoperative pyelogram showing a hydrocalyx containing the calculi. *c*, A postoperative pyelogram showing the healed kidney following removal of the upper third of the left kidney.

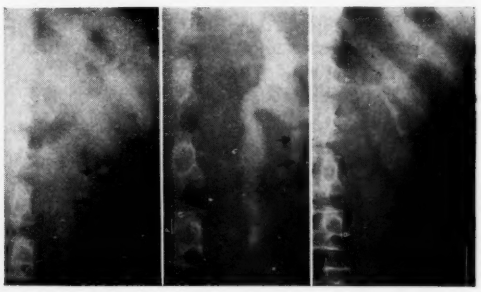

Fig. 5. Case 5. *a*, Film taken prior to operation; the upper two arrows point to calculi in lower pole of left kidney and the lowest arrow points to calculus in the midportion of the left ureter. *b*, Film is a preoperative ureteropyelogram. A left ureterolithotomy was performed first, and one year later the lower third of the left kidney was removed. *c*, Film was taken several months after partial nephrectomy and shows a well healed and normal functioning kidney. The pelvis and calyces have been outlined for clarity.

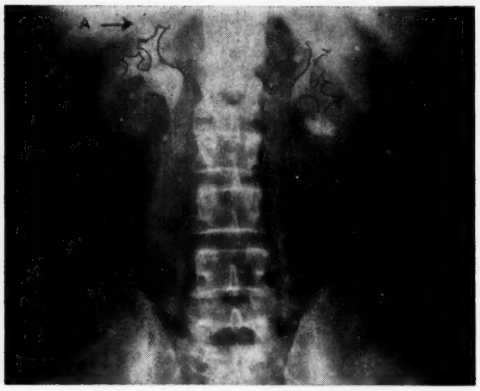

Fig. 6. Case 11. Bilateral pyelogram showing multiple calculi *A* within a hydrocalyx in the upper pole of the right kidney and a group of calculi *B* in a hydrocalyx in the lower pole of the left kidney. The pelves and calyces have been outlined for clarity. The upper pole of the right kidney was removed first and 2 months later the lower pole of the left kidney. Postoperative films are not available but the patient is known to be well and free of calculi and infection 2 years after operation.

Adequate drainage of the renal fossa is essential to forestall the development of an infection about the operative site. One or two Penrose drains placed in the renal fossa against the posterior surface of the kidney close to the renal wound usually suffice. These drains are shortened on the third or fourth postoperative day and removed by the seventh day. For the past 3 years we have abandoned the use of sulfanilamide or sulfathiazole powder in the operative wound in all kidney operations. We have more faith in a strict aseptic technique and meticulous performance of every step in the operation for the prevention of postoperative complications.

CASE REPORTS

We have chosen to report in detail the 3 most interesting cases in our personal series of 17 cases. The first patient (Case 11) had a bilateral partial nephrectomy. The second patient (Case 14) developed secondary hemorrhage following partial nephrectomy and required secondary nephrectomy. The third patient (Case 13) presented bilateral staghorn calculi with multiple calculi in the lower calyx of each kidney and partial nephrectomy was lifesaving inasmuch as the opposite kidney presented nonfunctioning calculous pyonephrosis and was subsequently removed.

Case 11 (U 49071-1,2) H.F., that of a white male, 50 years of age and married, was admitted to Sinai Hospital on July 27, 1947. He complained of dull pain in the right lumbar area of 1 month's duration. He also complained of pain across the lumbar spine and in the left kidney area. The only urinary symptom was nocturia (1 or 2 times each night). His family physician discovered pus in the urine and referred him for urologic study. The past and family histories were noncontributory.

Physical examination was negative except for tenderness in the right upper quadrant and right lumbar area. The urine was alkaline and showed a faint trace of albumin. Microscopic examination showed innumerable pus cells. Urine culture disclosed the hemolytic staphylococcus aureus. Phenolsulfonphthalein excretion was 60 per cent in 2 hours. A complete blood count was within normal limits. The blood urea was 39 mgm. per cent and the blood sugar was 69 mgm. per cent.

A plain roentgenogram showed an opaque shadow, 1.5 cm. in diameter, in the upper pole of the right kidney and two shadows measuring 2.5 by 1.5 cm. and 0.5 cm., respectively, in the median aspect of the lower pole of the left kidney. Intravenous urography showed the shadow in the right kidney to be situated in the dilated terminal calyx of the upper major calyx and a moderate dilatation of the right renal pelvis. The two shadows in the left kidney were situated in the dilated terminal calyx of the lower major calyx. Phthalein excretion was 10 per cent from the right kidney and 8 per cent from the left kidney in 15 minutes. The diagnosis was (1) localized calculous pyonephrosis of the upper calyx of right kidney and (2) localized calculous pyonephrosis of the lower calyx of left kidney (Fig. 6).

Penicillin and sulfonamide therapy was instituted. On July 29, 1947 the upper pole of the right kidney was removed under pentothal cyclopropane anesthesia. A cobbler stitch of No. 0000 chromic catgut was inserted before the wedge-shaped excision was performed and sufficed to control the bleeding. Deming nephropexy was performed at the end of the operation. At operation the right kidney was of normal size and appeared to be lobulated in the upper third. The lobulated area was demarcated from the remaining portion of the kidney by thick adherent bands of fibrotic tissue. Evidence of scarring and infection was present on the surface of the lobulated areas. The calculus could be easily palpated through the thin cortical tissue. At the conclusion of the operation, roentgen examination failed to reveal any calculi. The total operating time was 75 minutes.

The resected portion of the kidney measured 4.8 by 3.5 by 1.5 cm. On section, the parenchyma was reduced in size and measured 1 cm. in thickness. The corticomedullary line of demarcation was absent. The dilated calyx contained two stones, one measuring 1.5 by 1.2 by 0.6 cm. and the other, 0.3 cm. in diameter. The pathological diagnosis was (1) acute and chronic pyelonephritis, (2) chronic pyelonephritis, and (3) nephrolithiasis.

The postoperative course was uneventful except for a mild pyelonephritis which responded promptly to penicillin therapy. The wound was entirely healed by the ninth postoperative day and the patient was discharged on the eleventh postoperative day. He returned for weekly examination and was entirely symptom-free. He was given an acid ash diet and large doses of vitamin A.

His second admission to the hospital was on October 13, 1947. Physical examination was entirely negative. The urine was still alkaline but showed no albumin. Microscopic examination revealed only 5 or 6 pus cells per high power field. No organisms were found in the urinary sediment. The blood urea was 48 mgm. per cent. Roentgen examination showed no shadows in the right kidney but there were two small shadows in the lower pole of the left kidney.

On October 14, 1947 a left partial nephrectomy was performed under sodium pentothal-ether anesthesia. The lower third of the left kidney was removed by a wedge-shaped excision. A cobbler stitch was inserted prior to excision to control the bleeding. The operating time was 2 hours. At operation, marked perinephritis was noted, particularly in the region of the lower pole, which interfered with exposure and delivery of the kidney. A small portion of perinephritic fat remained attached to the lower pole of the kidney of which the surface was irregular and darker than normal. The calculi could be palpated through the thinned cortical tissue.

The resected portion of the kidney measured 5 by 3 by 2.5 cm. The surface was reddish brown and irregular. On section, the terminal calyx was dilated and contained a grayish brown stone and numerous calcareous particles. The parenchyma was thinned and showed several hemorrhagic foci. The pathological diagnosis was (1) acute and chronic pyelonephritis, (2) pyohydrocalycitis, and (3) nephrolithiasis.

The postoperative course was complicated by acute pyelonephritis which responded quickly to penicillin therapy. A superficial wound infection appeared on the eighth day, which cleared promptly. The wound was dry and healed on the twelfth day, when the patient was discharged from the hospital. The urine was clear and contained an occasional pus cell but no organisms.

The patient returned periodically for examination and observation. Intravenous urography on December 3, 1948 showed prompt excretion of dye. Both kidneys were well filled and showed no evidence of pyelectasis or caliectasis. Retrograde pyelography on December 10, 1948 substantiated this finding. Phthalein excretion from the right kidney was 10 per cent and from the left kidney 8 per cent in 15 minutes, which indicated no loss of renal function following the operation. The resected areas were sharply demarcated. The urine became entirely free of pus cells. The general condition showed marked improvement. The patient was given an acid ash diet and high vitamin A therapy. There was no evidence of stone recurrence on roentgen examination on January 26, 1949, 15 months after operation.

Case 14 (U 51180-1) E.J., that of a white male, 26 years of age (a carpenter), was admitted to Sinai Hospital on October 9, 1947. He complained of gross hematuria and burning on urination of one week's duration. There was no associated pain of any type nor any other urinary symptoms. Cystoscopy and pyelography were performed 3 days prior to admission to the hospital and revealed a calculus (1 cm. in diameter) in the terminal portion of the lower major calyx in the left kidney and an oval calculus 2 by 1 cm. in the bladder. Following this examination acute pyelonephritis developed, which responded to penicillin therapy.

The past history was negative. The mother of the patient had had one kidney removed for unknown reasons and a sister had a kidney stone.

On admission, physical examination was entirely negative. The urine gave a neutral reaction and contained from 10 to 12 red blood cells and from 2 to 4 pus cells per high power field. The blood count was normal. The blood urea was 35 mgm. per cent.

On October 10, 1947 cystoscopy was performed under intravenous pentothal anesthesia. The vesical calculus was crushed and removed. There was no reaction to this procedure.

On October 14, 1947 a left partial nephrectomy was performed under sodium pentothal anesthesia. The operation lasted 90 minutes and was accompanied by little bleeding and no shock. At operation the kidney appeared normal but the ureter was dilated to 3 times its normal size and showed a moderate periureteritis. The upper pole of the left kidney was removed in a wedge-shaped manner with the high frequency current. The opened calyx was closed with a continuous suture of No. 00 plain catgut and the renal wound closed with a continuous through-and-through Tuffier suture of No. 00 chromic catgut.

The postoperative course was uneventful for the first 4 days except for slight elevation of the temperature. On October 18 the patient developed gross hematuria which persisted despite supportive therapy, i.e., transfusions, vitamin K therapy, absolute quiet, and ice bags. On October 22, cystoscopy under pentothal anesthesia was performed and numerous clots were evacuated from the bladder. A No. 9 ureteral catheter was passed up into the pelvis. The pelvis was lavaged with saline solution and aerosol and 10,000 units of topical thrombin were instilled, after which the catheter was plugged for 30 minutes. The patient was returned to his room in good condition. However, the gross hematuria continued and on October 23 he was taken to the operating room with the intention of controlling the bleeding and preserving the remaining portion of the kidney.

At operation the lateral lumbar and abdominal muscles and perirenal tissues were suffused with blood. The lower two-thirds of the kidney was necrotic and macerated. The ureter was dilated to from 3 to 4 times its normal size. Conservation of the kidney appeared hopeless and the kidney was removed. The operation required 45 minutes and was accompanied by mild shock which responded quickly to the usual stimulative therapy but did not require transfusion.

The pathological reports were interesting. The tissue removed by partial nephrectomy measured 5 by 3.2 by 2 cm. The surface was coarsely nodular, congested, and slightly lobulated. On section, the glomeruli stood out as grayish dots. The dilated calyx contained a rough grayish calculus 1 cm. in diameter. The pathological diagnosis was (1) chronic pyelonephritis, (2) chronic calycitis, and (3) nephrolithiasis.

The remaining portion of the kidney weighed 153 grams and measured 11.5 by 6 by 5 cm. The upper pole was macerated and contained numerous unabsorbed catgut sutures. The main renal branches could not be made out. The surface of the entire kidney was hemorrhagic. On section, the entire parenchyma appeared to be severely damaged with areas of diffuse hemorrhage and necrosis. The cortical and medullary demarcations were indistinct. The pyramids were blunted and the calycine and pelvic mucosa were hemorrhagic and necrotic. The diagnosis was (1) extensive subacute and chronic pyelonephritis, and (2) multiple areas of infarction, necrosis, and hemorrhage.

Following the secondary nephrectomy the patient developed a mild deep infection of the renal wound which responded rapidly to drainage and antibiotics. He was discharged on the twenty-eighth postoperative day with the wound healed. The blood urea was 16 mgm. per cent and the urine negative.

Case 13 (U 49092-1) S.L., that of a white female, 52 years of age and married (a housewife), was admitted to Sinai Hospital on July 28, 1947. The complaint was hematuria and pyuria. Six weeks prior to admission the patient had developed urgency, frequency, nocturia, dysuria, and burning. Some relief was obtained with sulfonamide therapy.

Physical examination was negative except for tenderness over both kidneys. The urine was alkaline and contained innumerable pus cells. The blood count was normal. The blood urea was 48 mgm. per cent. The phenolsulfonphthalein excretion was 50 per cent in 2 hours.

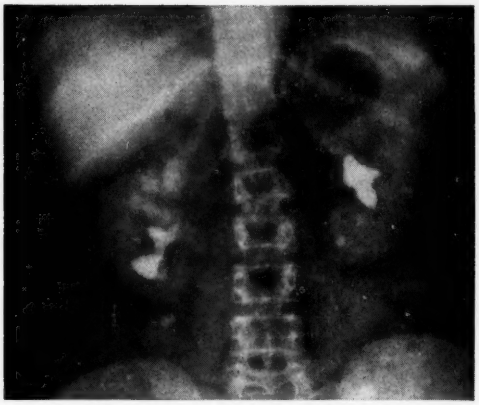

Fig. 7. Case 13. Preoperative plain plate showing large branched calculus in the pelvic region of the right kidney with numerous small calculi in the lower pole of the right kidney. Similar condition in the left kidney which was practically functionless.

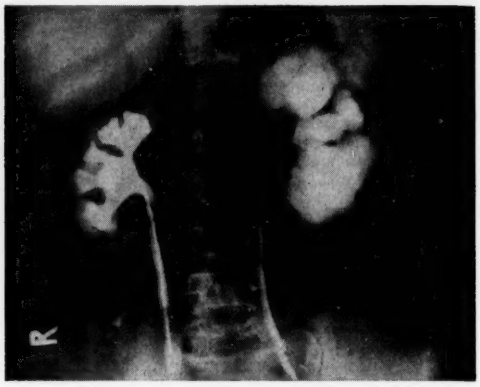

Fig. 8. Case 13. Preoperative pyelogram showing extensive bilateral calculous pyonephrosis.

On July 29, 1947 cystoscopy and pyelography were performed under intravenous pentothal anesthesia. A plain roentgenogram disclosed a coral calculus in each pelvis and a collection of a large number of small calculi in the lower pole of each kidney. Pyelograms disclosed a mild hydronephrosis and caliectasis on the right and a marked hydronephrosis and caliectasis on the left. The left kidney was not functioning (Figs. 7, 8).

On August 11, 1947, the lower pole of the right kidney was removed under pentothal anesthesia. The large staghorn calculus was removed through the opening in the pelvis made at the time of partial nephrectomy. The opening into the pelvis was closed with a continuous No. 00 plain catgut suture. The wedge-shaped wound was closed with two layers of mattress sutures underpinned with fat after a large pad of fat had been placed in the wound.

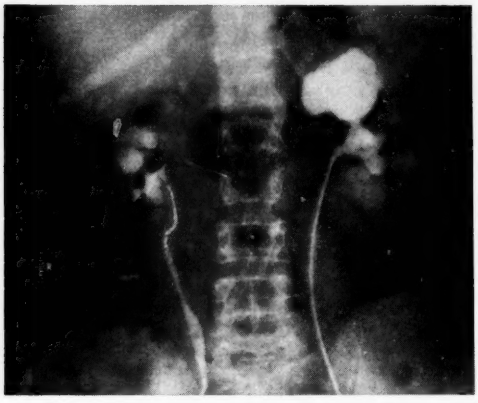

Fig. 9. Case 13. Postoperative pyelogram taken after right partial nephrectomy, i.e., removal of the lower pole of the right kidney including the large branched calculus. The upper portion of the right ureter has been outlined for clarity.

At operation the kidney was of normal size but presented numerous lobulations and scars suggestive of previous infection and infarction. The ureter was normal.

The resected portion consisted of two pieces of tissue. One measured 6.5 by 5 by 4 cm. and the other 6 by 2 by 1.5 cm. The capsule stripped with ease, revealing a lobulated yellowish brown surface. Impacted within the lower calyx was one end of a staghorn calculus measuring 4 by 3 by 1 cm. In the inferior branch of the lower major calyx there were many small grayish brown stones measuring from 2 to 3 mm. in diameter. The pyramids were blunted. The cortical and medullary markings were distinct and the glomeruli were prominent as grayish dots. The pathological diagnosis was (1) hydronephrosis and hydrocalyx, (2) chronic calycitis and pyelitis, and (3) nephrolithiasis.

The postoperative course was stormy for the first few days because of acute pyelonephritis and paralytic ileus. There was urinary leakage from the wound which subsided on the fourteenth day and the patient was discharged with the wound healed on the nineteenth day. The blood urea was 49 mgm. per cent. A plain roentgenogram before discharge showed no calculi in the right kidney. An intravenous pyelogram showed the right pelvis and upper calyces to be well filled and slightly dilated. On October 27, 1947 the phthalein test with a catheter in each ureter showed 15 per cent excretion from the right kidney and only 3 per cent from the left kidney in 30 minutes. The urine from the right kidney was negative for pus cells but that from the left kidney contained many pus cells. The right pyelogram showed a good functioning kidney which was rotated as a result of nephropexy (Fig. 9).

On February 11, 1948, the patient was readmitted to Sinai Hospital and 2 days later a left nephrectomy was performed. A large calculous pyonephrotic kidney containing a staghorn calculus with innumerable small calculi in all of the calyces was removed. The patient was discharged from the hospital on the tenth postoperative day with the wound entirely healed. On April 20, 1949 (21 months after operation), her condition was excellent. The urine showed an occasional pus cell but no organisms. Roentgen film showed no calculi in the right kidney.

CONCLUSIONS

1. The authors have collected and analyzed 193 cases of partial nephrectomy for localized calculous disease of the kidney, which include 17 personal cases.

2. The operative mortality for partial nephrectomy for localized calculous disease is relatively low, i.e., 2.58 per cent, and compares favorably with the average mortality rate reported for pyelolithotomy (2.4 per cent), nephrolithotomy (9.8 per cent), and nephrectomy (6.3 per cent).

3. The general morbidity rate of partial nephrectomy for localized calculous disease is insignificant and, as a rule, is considerably lower than that associated with other operations for renal lithiasis.

4. The incidence of secondary hemorrhage is lower following partial nephrectomy (3.1 per cent) than following pyelolithotomy (4 per cent) and nephrolithotomy (10.5 per cent).

5. The incidence of persistent urinary fistula is decidedly lower following partial nephrectomy (1.5 per cent) than following pyelolithotomy (4.1 per cent) and nephrolithotomy (12.5 per cent).

6. Recurrent stone formation is less frequently observed following partial nephrectomy (2.0 per cent) than following pyelolithotomy (10.9 per cent), nephrolithotomy (15 per cent), and nephropyelolithotomy (24.7 per cent).

7. Partial nephrectomy is the operation of choice when the calculous process is localized to the upper or lower calyx and it is anatomically possible to remove the affected portion of the kidney without destroying the blood supply to the remaining portion of the kidney.

8. Partial nephrectomy may be an operation of necessity in cases of extensive bilateral renal lithiasis when it is desirable to preserve more than one-half of one kidney and remove the other kidney. In such cases partial nephrectomy may be veritably lifesaving.

9. A partial nephrectomy enables the surgeon to conserve sufficient functioning renal tissue to sustain life adequately in the event that disease or injury should destroy the opposite kidney.

10. Partial nephrectomy is not a technically difficult nor time-consuming procedure in properly selected cases.

11. The successful result of a partial nephrectomy is dependent upon careful adherence to an orderly plan of operation, as indicated in this article.

12. A review of the literature and personal experience in 17 cases have demonstrated that the fear of secondary hemorrhage, persistent urinary fistula, recurrent stone formation, serious reduction in renal function, hypertension, and other postoperative complications is entirely unwarranted.

13. Partial nephrectomy should be used more frequently by competent urologists.

14. The indications and technique should be included in the training of every young urologist.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

The Fractured Mandible. G. KENNETH LEWIS. *J. Oral Surg.*, 1950, 8: 95.

This article constitutes a general and rather all inclusive review of the fractured mandible and its treatment.

The author first briefly considers the basic anatomy, function, and mechanical factors in this injury. Each type of fracture is discussed separately, beginning with fractures of the condyles and continuing downward and forward to those of symphysis of the jaw. The character of deformity produced and the means of reduction and fixation are carefully discussed. Attention is given to the edentulous mandible. The latter part of the article covers more specific points in treatment. Emphasis is placed on the necessity for proper feeding with adequate caloric intake to maintain weight and physical effort. Block anesthesia with procaine hydrochloride through the mandibular foramen was preferred. General anesthesia was used in only a small number of the patients. The importance of emptying the stomach before the giving of such anesthesia is emphasized.

Multiple loop intermaxillary elastic traction was the commonest method of fixation used. External splints and direct wiring were used in selected cases. Fractures with loss of substance were immobilized in their occlusal position to await bone graft. Five patients received bone grafts consisting of cancellous bone from the ilium. There were no failures of the graft in any of these cases. The period of fixation in uncomplicated fractures varied between 27 and 49 days, with an average of 35 days; in those with infection the period of fixation varied between 45 and 93 days. Limitation of motion following removal of fixation was of short duration and offered no difficulty.

The author concludes that the use of any one method of fixation and reduction is impractical, and a variety of methods are necessary for proper management of this injury. The article is well illustrated with drawings, radiographs, and photographs demonstrating the various types of fracture, means of reduction and fixation, and the mechanical principles involved. DONALD C. GEIST, M.D.

Sialography. F. JOHNSON PUTNEY and MYRON J. SHAPIRO. *Arch. Otolar.*, Chic., 1950, 51: 526.

When the diagnosis of diseases of the salivary glands is obscure, a radiopaque medium can be injected into the duct system and parenchyma of the two chief salivary glands.

The authors describe the anatomy of the parotid and submaxillary glands, and the technique of injection and roentgenography. The duct orifice is located, dilated, cannulated, and 1 to 1.75 c.c. of iodized oil are slowly injected. Immediate roentgen exposures are made. The procedure is not usually associated with reaction or discomfort.

The following indications for sialography are given: (1) demonstration of normal relationships; (2) salivary fistulas; (3) calculi, foreign bodies, strictures, and diverticula of ducts; (4) chronic recurrent parotitis; (5) relationship of gland and ducts in contiguous pathologic conditions; (6) determination of encapsulation and location of tumors; (7) relationship of salivary gland tumors in tonsillar region; (8) planning operative procedures; and (9) cases of dry mouth. Sialography is contraindicated in the presence of acute infection in the gland.

Obstruction of the duct may be caused by infection, calculi, trauma, or stricture, and presents sialographic changes of dilatation of the main and chief contributory ducts, and slight to marked dilatation of peripheral ducts. Obstructing calculi and fibrosis cause incomplete filling of the ducts.

Tumors cause pressure changes in the duct system and obliteration of the fine ductules. Extrinsic tumors cause a defect in the glandular shadow, with a well demarcated gland margin and uniform radiodensity of the parenchyma secondary to pressure. Benign salivary gland tumors produce a filling defect outlined by displaced ducts and changes in the parenchymal shadow. Tumor and normal gland are not sharply demarcated. Sialectasis may occur beyond the tumor. Malignant and benign tumors cannot be easily distinguished.

Salivary calculi are readily diagnosed and intraglandular and extraglandular location can be differentiated roentgenographically. Multiple abscesses produce large irregular cavities. Accessory salivary glands are sometimes discovered.

S. LLOYD TEITELMAN, M.D.

EYE

Sarcoidosis of the Orbit. MARTIN BODIAN and MORTIMER A. LASKY. *Am. J. Ophth.*, 1950, 33: 343.

Sarcoidosis, an unusually benign condition, is essentially a disease of the reticuloendothelial system. For this reason one is not surprised at its widespread distribution. Occasionally a low grade fever may persist over a period of weeks or months, which suggests tuberculosis or brucellosis. Occasionally the oculist is consulted because of some eye involvement. The skin lesions may bring the patient to the dermatologist as the first consultant. At other times, the disease is first diagnosed by the roentgenologist during the viewing of x-ray studies of the

hands, feet, or chest. Once a clue has been discovered in these ways, further examination of the patient will usually reveal other confirmatory findings.

Levitt compiled 100 cases of sarcoidosis appearing in the literature. In 43 of these patients the eye was involved. Of these, the uvea was involved in 28 patients, the lacrimal gland in 9, the skin of the lids in 7, and (possibly an end result of uveitis), the conjunctiva in 6; 10 had phthisis bulbi (possibly an end result of uveitis). No mention is made of orbital involvement, with sarcoidosis as a separate entity.

The essential pathologic findings of sarcoidosis consist of a granulation tissue composed mainly of epithelioid cells with some giant cells interspersed. Eosinophiles are frequently present. A modest sprinkling of lymphocytes and fibrous tissue proliferation may also be seen on the microscopic section. Because of the tuberclelike formation, the section resembles very closely one of tuberculosis; the two outstanding differences are the lack of caseation and the absence of tubercle bacilli.

A case of typical sarcoidosis, with lung, bone, and orbital involvement is presented. The unusual feature of this case is the presence of masses of sarcoidosis in the orbit. Otherwise the eyes and their adnexa were apparently free of the process. Excision and pathologic examination of 2 of the 4 orbital tumors showed the typical pattern. This included tubercle formation with epithelioid cells and giant cells, and the absence of caseation.

Arguments against the tuberculous nature of sarcoidosis are: smears, cultures, and animal inoculations have been uniformly negative for the organism; untreated sarcoidosis tends to spontaneous disappearance, and tuberculosis of an organ tends to progress—frequently even under proper treatment; caseation is not part of the pathologic process in sarcoidosis; unlike tuberculosis, family histories have thus far been negative in sarcoidosis; the tuberculin tests have demonstrated a relative anergy in sarcoidosis; general symptoms such as fever, weakness, and lassitude are unusual in sarcoidosis as compared to tuberculosis. MICHEL LOUTFALLAH, M.D.

Treatment of Convergent Squint Associated with Hypermetropia. GRACE VAUGHTON and MAUREEN STEWART. *Brit. J. Ophth.*, 1950, 34: 212.

In cases of convergent squint with hypermetropia, when the relationship between convergence and accommodation breaks down the patient makes an excessive convergence effort to obtain clear vision uniocularly. If diplopia has been present an effort is made to separate the images far enough for them not to be confusing and suppression is thus facilitated. The breakdown between accommodation and convergence is probably due to a deficiency in the power of relative accommodation; namely, the ability to accommodate in excess of convergence.

When the need for excessive accommodation is reduced, the excessive convergence effort will undergo relaxation. The patient should be fully corrected for all hypermetropia and astigmatism found by retinoscopy, with accommodation paralyzed by a cycloplegic. This correction reduces suppression and straightens a large percentage of squints. It should also be used in unilateral and alternating types of squint requiring surgery.

FRANK W. NEWELL, M.D.

Late Fistulization of Operative Wounds. Diagnosis and Treatment. JOHN H. DUNNINGTON and ELLEN F. REGAN. *Arch. Ophth.*, Chic., 1950, 43: 407.

Owing to imperfect closure, any penetrating wound of an eyeball, either traumatic or surgical, may be followed by a cystoid scar. This fistulous tract may be large or small, may be constantly open, or may be closed at times and open at others.

The usual history in patients with this condition is that of an uneventful intraocular operation and a quiet postoperative course. Often a slightly irregular pupil or an incarcerated iris pillar and a small cystoid scar are present, but the visual acuity after operation is good and the general appearance of the eye is satisfactory. Such a state may continue for weeks, or even months. Then the patient returns with complaint of tearing, intermittent blurring of vision, and a dull ache about the eye. The symptoms are often transient, and occasionally they are worse on awakening in the morning.

Examination of the wound frequently reveals a cystoid area of the conjunctiva that is soft and pits on pressure, while in some cases the wound appears flat and the tiny opening escapes detection. If one places a drop of fluorescein on the suspected area and then applies gentle but firm pressure to the globe, a leakage of aqueous is usually demonstrable. Since these fistulous cicatrices are at times covered by a thin layer of conjunctival epithelium, this test does not invariably give a positive result. Repeated examinations are occasionally required to establish the intermittent nature of the leakage of aqueous. If the anterior chamber becomes shallow with the application of pressure to the globe, it is corroborative evidence of slow fistulization.

Should such a situation be permitted to continue, the visual acuity will decrease and the patient's symptoms will become severe, resembling in every detail those found in low grade iridocyclitis. At this stage, examination with the corneal microscope will reveal a slight flare and a few cells in the anterior chamber. There may be an increase in the number of opacities in the anterior vitreous. If the hypotony persists, edema of the optic nerve may ensue, or there may be sufficient edema of the retina in the macular region to simulate a flat detachment of the retina. A late complication of more serious import is epithelization of the anterior chamber. Late infection is always a danger in the presence of fistula.

The following methods of treatment of fistulizing wounds with hypotony have been proposed:

Medical or expectant treatment. Ethylmorphine hydrochloride ("dionin"), atropine sulfate, hot compresses, and pressure dressings.

Cautery. The application of some form of cautery to flatten the cystoid area has been advised for many years. The electric cautery for prolapse of the iris, or cauterization with trichloroacetic acid was advocated. Repeated applications of 10 per cent silver nitrate to cystoid scars producing hypotony, diathermy, and Shahan's thermophore have been helpful in cases of late hypotony after trephining.

Conjunctival flap. Probably the most widely accepted method of treating a filtering cicatrix is the use of a Kuhnt or Van Lint type of conjunctival flap, but it has not appeared uniformly successful.

Suturing of the Fistula. A successful closure of a fistula is more certain if, in addition to use of a conjunctival flap for covering the wound, the corneal and scleral lips of the tract are approximated by suturing.

The method of choice has been a combination of cauterizing the opening, suturing its edges, and covering it with a conjunctival flap.

MICHEL LOUTFALLAH, M.D.

Blastomycosis of the Conjunctiva. E. THEODORIDES and KOUTROLIKOS. *Am. J. Ophth.*, 1950, 33: 535.

Two cases of blastomycosis of the conjunctiva (from Greece), both occurring in young military personnel, are reported. The affected eye showed a foamy white spot on either side of the limbus in the horizontal meridian. In the first patient, in which the condition was not immediately recognized, the other eye became involved after 2 weeks.

The complaint is simply that of foreign body sensation, tearing, and photophobia. The size of the spot varies from that of a pinpoint to that of a coffee bean. As the disease is quite rare, the clinical picture may be confused with Bitot's spots of vitamin A deficiency or the conjunctivitis due to Penicillium glaucum. The diagnosis is made from a microscopic study of fresh smears.

The most effective therapy proved to be the local application of 2 per cent silver nitrate or 20 per cent zinc sulfate daily. Recovery ensued after 3 or 4 such treatments.

JAMES E. LEBENSOHN, M.D.

Epithelial Invasion of the Anterior Chamber Following Cataract Extraction. Effect of Radiation Therapy. MORRIS H. PINCUS. *Arch. Ophth.*, Chic., 1950, 43: 509.

Epithelial invasion of the anterior chamber is a most malignant postoperative complication of cataract extraction. The estimated incidence of this complication varies from 0.06 to 0.11 per cent. The time interval between the extraction of the cataract and the clinical recognition of epithelization of the anterior chamber in this series of cases varied from 3 weeks to 5 months. Conditions predisposing to the development of this complication are delayed formation of the anterior chamber and poor healing of the wound edges. The latter may be due to an intraocular hemorrhage, incarceration of the iris, capsular remnants in the wound, or prolapse of the vitreous. The possibility of this complication is greatly strengthened by observation of the grayish haze on the posterior surface of the cornea which gradually progresses downward.

If the epithelization is allowed to progress, the eye is inevitably lost through severe iridocyclitis and glaucoma.

Prevention rather than treatment should be one's aim. Use of the preformed conjunctival flap, 3 to 4 mm. in width, extending around the circumference of the wound, would eliminate the possibility of implantation of epithelium, as no instrument would pass into the anterior chamber through an epithelial surface.

Any treatment which offers the slightest chance of arresting or retarding the development of this complication must be seriously considered. Operative intervention is of no avail. Application of the actual cautery to the fresh wound and the posterior surface of the cornea produced good results. Use of roentgen therapy or the radon plaque offers hope of retarding, arresting, or even curing this condition.

The clinical history, type of operation, postoperative course, and use of the radon plaque and roentgen radiation in 5 cases are reviewed. Retardation of the epithelial downgrowth was noted in 2 cases; definite recession took place in 1 case; no improvement was noted in 1 case and the eye was enucleated 4 months after the cataract extraction. The pathologic report in this case corroborated the clinical diagnosis of epithelial invasion of the anterior chamber.

MICHEL LOUTFALLAH, M.D.

Use of Curare in Cataract Surgery. DANIEL B. KIRBY. *Arch. Ophth.*, Chic., 1950, 43: 678.

Curare (intocostrin or *d*-tubocurarine) was used intravenously to supplement sedation, local anesthesia, and palpebral akinesia in over 100 cases. The ages of the patients varied from 24 to 82 years. Dosage varied from 40 to 60 units (6 to 9 mgm.). The drug was indicated if, after adequate sedation and analgesia combined with deep local anesthesia and palpebral akinesia, the patient still moved his eyes, squeezed the fellow eye, had rigidity of the neck muscles, or respiratory neurosis. Twenty units of intocostrin or *d*-tubocurarine are injected intravenously over a one minute period and the surgeon observes the fellow eye for development of ptosis. An additional 10 units of the drug are injected at 30 second intervals until ptosis is observed, or 40 units have been administered. After administration of 40 units, a pause of one minute is made before more is injected. Usually 40 to 50 mgm. are sufficient.

The ocular muscles are the first to be affected and the last to recover. Initially there is haziness of vision, ptosis, ocular muscle imbalance, and inability to raise the head, followed by relaxation to complete paralysis of the long muscles of the back and of the extremities. Larger doses affect the intercostal muscles and diaphragm. The drug should be administered only by those who are prepared to administer artificial respiration and trained in resuscitation. In ocular surgery the eye is not incised until

danger of respiratory paralysis has passed—usually 2 or 3 minutes after injection. Thiopental with curare is advised in those patients who are not suitable subjects for surgical procedures under local anesthesia. FRANK W. NEWELL, M.D.

Retrolental Fibroplasia. A Clinical Study of 238 Cases. MERRILL J. KING. *Arch. Ophth.*, Chic., 1950, 43: 694.

Retrolental fibroplasia is characterized by an opaque vascularized membrane behind the lens, microphthalmia, shallow anterior chambers, fetal blue color of the iris, thin ciliary processes in front of the opaque tissue, searching nystagmus, apparent photophobia, persistent hyaloid artery, and often retinal separation. Prematurity is the predisposing factor in a large majority of the cases.

The clinical observations in a series of 238 patients, some followed as long as 7 years, are presented. The condition is almost always bilateral; it may, however, be much more extensive in one eye than in the other. The membrane varies in development from a well defined, opaque, grayish-white, vascularized tissue lying against the posterior surface of the lens to a nebulous, grayish collaret in the region of the pars plana. It varies in density throughout its extent. In incomplete membrane formation, bands frequently extend between the fibroplasia and the retina. Blood vessels in the retrolental membrane attenuate and almost disappear in the older patient. When seen, the fundi usually show degenerative changes especially in the macular region; pallor of the nerve head is not uncommon.

One hundred and ninety-four of these patients weighed less than 4 pounds at birth; 101 patients weighed less than 3 pounds; 34 patients weighed from 4 to 5 pounds; none weighed more than 5 pounds at birth. There is no evidence to indicate a hereditary factor. The condition occurred in more than one member of a single family only in cases of multiple births, a common cause of prematurity. Males were involved in 149 cases and females in 89. Except for multiple births, no significant cause of prematurity was found.

The condition should be distinguished from retinoblastoma and pseudoglioma. Retinoblastoma has a later onset, is seen in an eye of normal size and appearance, and, at its onset, is usually unilateral. Pseudoglioma is generally unilateral and usually follows an acute infectious disease. It is associated with more pain and congestion than is seen in early retinoblastoma or retrolental fibroplasia.

Cutaneous hemangioma was the only congenital anomaly to occur in significant numbers. The incidence did not vary from that observed in premature infants without retrolental fibroplasia.

Posterior synechiae were the commonest complication. Anterior synechiae form in cases of long standing as the anterior chambers continue to flatten. Glaucoma occurred in 43 patients and was usually relatively asymptomatic. Ocular hemorrhages were observed in 22 patients. Thirty of the entire group of patients have retained some vision. Two patients, however, who had maintained 20/200 vision over a period of 5 years suddenly became completely blind from total retinal detachments. No higher incidence of mental retardation has been found in children with retrolental fibroplasia than in the average group of premature children.

Treatment has been directed toward the prevention of synechiae and glaucoma. Homatropine, 1 per cent, and paredrine, 1 per cent, have been used in the morning and a miotic in the evening, one or two days a week. In some patients only a mydriatic or a miotic have been used. Surgical measures have been disappointing. FRANK W. NEWELL, M.D.

Detachment of the Retina in Young Adults. An Analysis of the Treatment of a Young Age Group at an Army General Hospital. AUSTIN I. FINK. *Am. J. Ophth.*, 1950, 33: 424.

A group of 80 unselected patients in a young age group (the majority being between 20 and 40 years of age) received a total of 139 operations for retinal detachment, with an overall incidence of success, i.e., complete reattachment of the retina, in 56 per cent of the cases. In 50 of the patients detachment of the retina was due to injury and in 30 patients the condition was nontraumatic. The high incidence of success in those cases without severe complications is attributed principally to the healthy choroidal and retinal vasculature present in young persons. In addition, visible disruption of the retina (holes, tears, and disinsertions) was found in 70 per cent of the cases.

For the most part, causes for failure were atttributed to the complicating factors of uveitis and penetrating injury. MICHEL LOUTFALLAH, M.D.

EAR

Bone Conduction in Otosclerosis. R. R. WOODS. *Arch. Otolar.*, Chic., 1950, 51: 485.

Acuity of hearing for masked bone conduction in a consecutive series of 39 cases of fenestration for otosclerosis is reported. In the three conversation frequencies these showed an average gain of 11.4 decibels. The author believes this indicates that part of the loss of bone conduction in otosclerosis is reversible and cannot be attributed to atrophy of disuse or to secondary nerve degeneration.

The author points out that in otosclerosis the first air conduction loss is in the low tones, while the first bone conduction loss is in the high tones. In the early cases, he believes, both losses are reversible by the fenestration operation, but in later cases this is not true. The operation itself by causing "disorganization of the middle ear" causes some air conduction loss.

The opinion is expressed that otosclerosis produces from the start a mixed, or at least a potentially mixed, deafness in which the conductive element predominates early and the perceptive element, later. JOHN J. BALLENGER, M.D.

The Carotid Canal as a Pathway for Extension of Infection in the Temporal Bone. J. G. DRUSS. *Ann. Otol. Rhinol.*, 1950, 59: 166.

The carotid canal is subject to invasion by suppuration within adjacent structures. A description is given of the relationship of the carotid canal to the tympanic cavity and the eustachian tube, to the jugular bulb, and to the cavernous sinus. Emphasis is placed on the importance of keeping in mind, when dealing with an otitic infection, the possibility of carotid canal involvement.

JOHN J. BALLENGER, M.D.

NOSE AND SINUSES

Malignant Melanoma of the Nose and Sinuses. JOSEPH G. SCHOOLMAN and HAROLD W. ANDERSON. *Ann. Otol. Rhinol.*, 1950, 59: 124.

After a brief review of the histology, clinical classification, and therapeutic approach to malignant melanomas, the authors present the histories of 6 additional cases of malignant melanoma of the nose and sinuses.

It is believed that the tumor is not found less frequently in the negro than in white patients, that the tumor should not be considered radioresistant, and that the prognosis is poor. "Biopsy, cautery, and diathermy seem to stimulate metastasis. Wide excision with the cold knife or irradiation appear to be the methods of choice" as far as treatment is concerned.

JOHN J. BALLENGER, M.D.

MOUTH

Primary Unilateral Harelip Repair. K. B. FRASER. *Austral. N. Zealand J. Surg.*, 1950, 19: 198.

Forty-five cases of primary unilateral repair of harelip have been selected from the author's series of "facial cleft" operations. He states that he favors the technique first described by Vilray Blair and subsequently elaborated by Barrett Brown and McDowall, and this, together with modifications, is given in detail.

A number of colored drawings are included to amplify the descriptions. The value of a good photographic record is stressed.

JOHN J. BALLENGER, M.D.

Irradiation as the Preferred Treatment of Cancer of the Lip. GEORGE S. SHARP, HERBERT F. WILLIAMS, and ROBERT E. PUGH, JR. *J. Am. M. Ass.*, 1950, 142: 698.

In the treatment of carcinoma of the lip the authors state that irradiation is their treatment of choice. Their judgment of the type of treatment to use is based on the dimensions of the lesion, particularly the depth of invasion, the curability of the primary lesion by the simplest method, and the best cosmetic result. In the authors' opinion, radium given by means of the surface plaque or interstitial needles fulfills these requirements and is most satisfactory in the majority of cases.

The absolute percentage of 5 year cures in 208 consecutive patients with cancer of the lip reported in this paper was 84.2, which patients included all that were lost for follow-up and all who died from intercurrent disease. If the lost patients are excluded as well as those known to be free of cancer of the lip when they died, the percentage of patients free of disease 5 years was 95.7, a closer approximation of the actual prognosis in this disease. Approximately 80 per cent of the lesions were in stage 1, with 100 per cent 5 year cures, except for 2 patients who died of other causes within 2 weeks of the treatment.

Among the 18 patients with microscopically proved metastases to the cervical nodes at the time of admission or during the course of their disease, the absolute cure rate was 61 per cent (11 of 18 patients).

JOHN J. BALLENGER, M.D.

PHARYNX

Congenital Diverticulum of the Posterior Hypopharynx Simulating Atresia of the Esophagus. E. S. BRINTNALL and W. W. KRIDELBAUGH. *Ann. Surg.*, 1950, 131: 564.

Two case histories are presented, each being that of an infant with a congenital posterior pharyngeal diverticulum simulating atresia of the esophagus. In both cases there was regurgitation of food from birth. The lipiodol swallow revealed filling of a blind pouch which was misinterpreted as being the upper esophageal segment of congenital esophageal atresia. There was no definite roentgenographic criteria which would serve to distinguish these cases from esophageal atresia.

Esophagoscopy in the first case was inconclusive as the esophagoscope passed into the diverticulum and the true esophageal orifice was not identified. In the second case pharyngoscopy revealed the true nature of the anomaly after a mediastinotomy revealed a normal esophagus.

Both patients died following surgery. Diverticulectomy was unsuccessful in the first patient because of a breakdown of the pharyngeal closure with subsequent mediastinitis. The second patient died 10 hours after an exploratory extrapleural mediastinotomy on account of pulmonary congestion and pneumonia.

Histologic sections of these diverticula showed a well developed muscle layer and mucosa. Diverticula of the alimentary tract are thought to have their origin in misplaced buds which retain communication with the parent organ. These congenital pharyngeal pouches are thought to have no relationship with pulsion diverticula which are seen in elderly individuals.

The authors plan to pharyngoscope future cases of "esophageal atresia" preoperatively, and by so doing hope to recognize congenital posterior pharyngeal diverticulum. They also believe that a two-stage removal of such diverticula may be safer.

JOHN R. LINDSAY, M.D.

The Problem of Hypopharyngeal Carcinoma. R. D. OWEN. *Proc. Royal Soc. M.*, Lond., 1950, 43: 157.

The subsequent history of 34 female patients seen at the Cardiff Royal Infirmary during the years of 1934 and 1935 are reported. All of these patients were under investigation for a syndrome consisting of dysphagia with anemia. This syndrome, the author states, is correctly known as the Paterson-Brown-Kelly syndrome, not as the Plummer-Vinson syndrome.

All 34 patients had direct esophagoscopies. Five of the patients developed a postcricoid carcinoma. The author believes the syndrome should be considered a precancerous state, and that once the syndrome is diagnosed, proper treatment is either repeated esophagoscopies as a method of routine followup when symptoms continue, or, if the dysphagia recurs with persisting mucosal changes, the vulnerable hypopharyngeal segment should be replaced by a skin flap.

If a carcinoma is found, Mr. Owen believes that the best approach is either a pharyngolaryngectomy or transthyroid pharyngotomy.

JOHN J. BALLENGER, M.D.

NECK

Surgical Treatment of Bilateral Abductor Paralysis of the Larynx. JOHN H. BARRETT. *Ann. Otol. Rhinol.*, 1950, 59: 112.

This article is concerned with the operative management of bilateral abductor paralysis of the vocal cords. The author first discusses the various operations now in use, particularly those of King and Kelly, and modifications by Clerf, Woodman, and Thornell. The advantages and disadvantages of these procedures are reviewed and discussed.

The author then presents a modification of the operative technique, offering several essential differences. The first of these is the use of a half Kocher incision through the old thyroidectomy scar as an aid to a better cosmetic result. The second change is the suture of the thyroarytenoid muscle through the wing of the thyroid cartilage, tying the suture over the thyrohyoid muscle; this is done following the removal of the arytenoid cartilage. A small drain is inserted and the patient is given penicillin postoperatively.

The article includes a report of 2 illustrative cases with photographs. DONALD C. GEIST, M.D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; CRANIAL NERVES

The Mechanism of Skull Fracture. E. S. GURDJIAN, J. E. WEBSTER, and H. R. LISSNER. *Radiology*, 1950, 54: 313.

Deformation patterns of the skull due to blows of low velocity, as well as the mechanism of production of linear skull fracture, have been previously described by the authors. When the dry skull is coated inside and out with "stresscoat" brittle lacquer, and then subjected to a blow, the lacquer cracks in the areas of greatest tensile deformation. The cracks appear on the outside of the skull in the regions in which the bone bends outward and on the internal surface where the bone bends inward. A region of inbending—generally circular, oval or star-shaped—always surrounds the point of application of a blow, no matter where it is struck. By means of the "stresscoat" technique, it has been shown that outbending of bone may sometimes occur at a considerable distance from the point of application of the blow.

A study of the stresscoat pattern of deformations of the skull and a comparison with clinical fractures indicate that most linear fractures are initiated on the outer surface of the skull by tearing-apart forces due to outbending of the bone. The evidence shows that a linear fracture, due to a blunt blow insufficient to cause a depression, is formed as follows: at impact, the area around the point of application of the blow is inbended. Simultaneously there is an outbending of the bone peripheral to the inbended area. This outbending is selective and may be localized to a certain part of the skull, where a linear fracture is initiated due to the resultant tearing-apart forces.

The present study deals with the determination of area of primary, secondary, and tertiary stress levels in the skull as a result of blows in various locations and the correlation of these findings with an analysis of experimental and clinical skull fractures.

The skull surface was divided into twelve areas. Each of these areas are roughly rectangular and measure 2 by 3 inches. Blows were administered in these regions, the point of impact being within the confines of the rectangles.

The experimental skull fracture tests were made on embalmed cadaver heads with scalp and contents intact, for comparison with the data from the stresscoat studies regarding the location and direction of fracture lines due to blows in specific regions, and to evaluate the influence of the presence of scalp and skull contents. The cadaver head, supported by means of a cord looped about it in such a manner that it would strike in the desired area when dropped, was allowed to fall freely through a measured distance and strike a 160 pound steel slab placed directly on a terrazzo floor. The product of the weight of the head and the distance through which it was dropped determined the energy of the blow.

The article is well illustrated with photographs of the skull showing the various "stresscoat" patterns for each of the various areas in the skull. An attempt is made by the authors to study clinical skull fractures which were seen in the Receiving and Grace Hospitals, in Detroit, and to try and correlate the resulting fractures in the light of the studies made with stresscoat.

Following impact, the area of primary stress level is the weakest region in the skull and it is the place where a fracture may be initiated with adequate energy. The area of secondary stress level is the region where a second fracture line may be initiated with additional energy. The areas of tertiary stress level are the regions where further fracture lines will be caused with expenditure of still more energy, resulting in a stellate pattern.

The area of primary stress level may be in different regions in different skulls. The mechanism of linear, stellate, comminuted, and depressed fractures is also described.

The authors conclude that blows on the anterior and posterior aspects of the head cause tearing-apart forces at the base, from side to side, resulting in fractures which traverse the base anteroposteriorly or posteroanteriorly. Parietal and lateral frontal blows cause tearing-apart forces at the base, anteroposteriorly. Fractures traverse the base from side to side with parietal and lateral frontal blows. The base of the skull is found to be extremely brittle.

With experimental skull fracture in cadaver heads, a single linear fracture has been obtained with as little as 400 inch pounds of energy.

In clinical cases of head injury, in which the position of the blow is known, the resultant fracture line is found in a position and direction predicted by the stresscoat study.

The position of the fracture may be used to tell accurately the position of the blow.

HOWARD H. LANDER, M.D.

Craniocerebral Trauma and the Vegetative Nervous System (Schaedel-Hirn-Trauma und vegetatives Nervensystem). R. WANKE. *Wien. med. Wschr.*, 1950, 100: 196.

Mechanically induced irritation of the brain manifests itself primarily by autonomic or vegetative reactions, and commotio cerebri is the outstanding example of pathology of the vegetative nervous system. A composite graph is presented showing the effect of classical commotio cerebri without associated injuries on the systolic and diastolic blood pressure; pulse and temperature; erythrocyte, hemoglobin, and leucocyte values; and on the serum bilirubin, blood sugar, alkali reserve, residual nitrogen, blood sodium, and calcium.

Values are plotted for a period of the first 4 days following trauma. All of the known reactions dependent on the vegetative nervous system, whether vasomotor, hematologic or metabolic, are encountered following central mechanical irritation of the brain stem. A perusal of the graph shows that some of these individual reactions are significant enough to be of possible practical value. Similar findings, although more intense and of shorter duration, have been obtained following ventriculography. Many such observations may prove of practical diagnostic and prognostic value in the evaluation of the severity and course of brain trauma.

The author adduces experimental evidence to show the dependence of individual vegetative reactions on central disturbances, and attempts to localize the central disturbance as well as to illustrate the mechanism whereby a central disturbance may produce apparently remote vegetative reactions. One experiment shows a relationship between injury in the region of the hypothalamus and massive, central pulmonary hemorrhage, hyperglycemia, and glycosuria. For indications of vegetative nervous reactions he lists the following observations: oculomotor disturbances, adrenalin tests, symmetrical bilateral skin temperature tests, regional blood pressure variations, electrodermatograms, chronaxia, and electroencephalography, and presents evidence that these are dependent on the vegetative nervous system. JOHN L. LINDQUIST, M.D.

Craniopharyngioma or Parapituitary Adamantinoma (Erdheim's Tumor). WILLIAM WALKER. *J. Path. Bact.*, Lond., 1949, 61: 359.

An unusual case of craniopharyngioma is reported. The patient was a 26 year old woman whose symptoms, due to a parapituitary adamantinoma, were antedated by a normal pregnancy. No other example of pregnancy could be found in a review of 204 craniopharyngiomas. It is believed that even marriage is rare in patients who have this type of tumor—that it must produce an early disturbance of the psychosexual constitution. This patient also had glycosuria without hyperglycemia. Sugar appeared in the urine when the blood sugar was as low as 90 mgm. per 100 c.c. The author doubts that this disparity is chance, and reasons that it is an expression of a multiglandular syndrome, damage to the pituitary causing a hypoglycemia, and depression of the hypothalamus causing glycosuria.

DANIEL RUGE, M.D.

Metastatic Melanoma of the Brain. Report of a Case with Unusually Long Survival Period Following Surgical Removal. VICTOR REYES and GILBERT HORRAX. *Ann. Surg.*, 1950, 131: 237.

The authors' review of other reports regarding metastatic melanomas to the brain indicates that the prognosis is poor with and without surgical removal or decompression. The usual survival periods listed are in terms of several months, particularly since metastases are usually multiple. They report an unusually long survival of a 57 year old male who is well 4 years after excision of a right cerebral metastatic melanoma. Eight months before his intracranial operation, the patient had a left axillary adenectomy and a left radical mastectomy, the pathological diagnosis of which was malignant melanoma. At the intracranial operation, a left frontoparietal osteoplastic craniotomy revealed a spherical, apparently encapsulated, brownish-black tumor about the size of a duck's egg which was removed without difficulty. The patient was slightly aphasic and for a short time had convulsive seizures, but 4 years after his operation is much improved, is working daily, and rarely has a convulsive seizure.

DANIEL RUGE, M.D.

Ventriculostomy of the Third Ventricle with Opening of the Supraoptic Lamina (La ventriculostomia del tercer ventriculo por apertura de la lamina supraoptica). JUAN P. RECAGNO C. *Arch. Soc. cirujan. hosp.*, Santiago, 1948, 19: 150.

This presentation considers an aspect of the treatment of hydrocephalus by means of ventriculostomy of the third ventricle with opening of the lamina supraoptica or terminalis. The operative technique has been used about 10 years but has never been reported in Chilean literature. After testing the patency of the cisterna by using azure dye according to the method of Dandy, the patient is prepared for surgery. A general anesthetic is given to the patient with pentothal or, in some cases, avertin given rectally, and reinforced with the local infiltration of procaine. A transfrontal craniotomy following a Dandy incision is made and the tissues are separated down to the cisterna and the supraoptic lamina. The floor of the ventricle is opened according to the Stookey and Scarff method. The character of the spinal fluid is appraised and reinjected or a physiologic solution is prepared according to a definite formula. There is usually very little postoperative difficulty encountered. Occasionally a fistula is produced, or a lesion which results in diabetes insipidus.

The indications for the operation are noncommunicating hydrocephalus, expanding lesions of the central region of the brain, occlusion of the aqueduct of Sylvius, and arachnoiditis of the posterior fossa. Communicating hydrocephalus, tuberculomas of the central nervous system, and cysticercosis should possibly be included.

Three cases demonstrating the effectiveness of the method are presented. STEPHEN A. ZIEMAN, M.D.

SPINAL CORD AND ITS COVERINGS

Bacitracin Levels in the Cerebrospinal Fluid After Parenteral Injections. Bacitracin Therapy of Experimental Staphylococcal Meningitis in the Dog. PAUL TENG and FRANK L. MELENEY. *Surgery*, 1950, 27: 403.

Experimental work with a new and powerful antibiotic, bacitracin, is described in this article. This

drug has a wide antibacterial activity and is active against both aerobic and anaerobic gram positive organisms. It is ineffective against gram negative; organisms except the gonococci and meningococci spirochetes and the Endamoeba histolytica are also susceptible. The difficulty has been to bring the antibiotics in contact with organisms in the spinal fluid, and, like the other antibiotics, bacitracin must be introduced intrathecally to be effective. Intravenous and intramuscular injections are effective only when there is inflammation of the meninges. Actual measurements are supplied in this article in tabular form to support this statement. Three human beings were treated with bacitracin, with essentially the same result as in experimental animals.

The second part of the article deals with the effects of bacitracin on experimentally induced staphylococcal meningitis in dogs. The original culture was obtained from an individual with a septic finger who had no other disease complications. In these dogs, it was found that bacitracin was effective, provided it was administered within a few hours of the injection of the culture. This depended somewhat on the virulence of the culture. With the culture at its most virulent stage, the bacitracin had to be injected within 1.5 hours. All the control animals died. Treatment by the intramuscular injection of bacitracin was inadequate. Both the culture and the bacitracin were injected into the cerebrospinal system of these animals. The article is supported by tables showing the levels of the antibiotic substance in the blood and spinal fluid.

ADRIEN VER BRUGGHEN, M.D.

Rhizotomy in Painful Conditions of the Hip Joints. A Postoperative Follow-up Study. LENNART HERLIN. *Acta chir. scand.*, 1949, 99: 113.

The most common cause of chronic hip joint pain is arthrosis deformans. It is chiefly a disease of the aged, but may occur in the forties. The typical localization of pain has been described as proceeding from the hip joint and radiating to the outer and anterior side of the thigh to the knee. This is practically the lumbar four dermatome and may therefore simulate the symptoms of intervertebral disc herniation at the fourth lumbar interspace. It may be differentiated by its absence of reflex changes, and its not being affected by coughing, straining, and sneezing. It is affected by movement of the hip joint, and roentgen examination will show early changes in the joint.

Since the distribution of the pain is similar to that caused by compression of the fourth lumbar nerve root, it seemed plausible to treat the pain by sectioning the fourth lumbar posterior root. This operation was done upon 46 patients between the years 1943 and 1946. Forty-four of the patients were observed from 2 to 5 years. Where poor results were obtained, the patient began to complain within the first year. Among the 44 patients who responded to a questionnaire, 13 showed satisfactory improvement, 9 showed some improvement, and 22 showed no improvement. In a few patients the adjoining sensory nerve roots were sectioned, but the author does not believe that this improved the results appreciably.

DANIEL RUGE, M.D.

PERIPHERAL NERVES

Delayed Suture of the Sensory Nerves of the Hand. JAMES M. SHAFFER and FRANK CLEVELAND. *Ann. Surg.*, 1950, 131: 556.

Considerable attention has been drawn to the suture of peripheral nerves in the last 3 years. Very little has been said about the results that may be expected in delayed nerve suture and especially when this type of suture is applied to purely sensory nerves. A total of 71 sensory nerves were repaired in procedures on the hands and fingers; 55 cases of median nerve repair and 16 cases of ulnar nerve repair. Usually a small branch is involved. The average time interval since injury to repair was 1½ years, the longest being 30 months. In many cases, other injuries of the bones, joints, and skin were repaired at the same time. The patients were thoroughly studied for a period of at least a year. Coarse touch was the first to return, usually within 3 months, in 95 per cent. Light touch was recovered in 86 per cent and in 14 per cent two-point discrimination was fully developed a year after suture. The exact results are summarized in tables.

Scar tissue in associated injuries has a deleterious effect on nerve regeneration. The technique of the operative procedures was more or less uniform. The authors had no hesitation in freeing nerves well up into the forearm or transplanting nerves at the elbow joint. When the defect was too great to permit union, nerve grafts from the sural nerve were used. All operations were performed with a blood cuff tourniquet. Nutritional changes in the involved parts of the fingers recovered rather rapidly after nerve regeneration. Considering the gratifying results obtained in these cases, every disabling nerve injury of the hand should be explored without reference to the time interval since wounding.

ADRIEN VER BRUGGHEN, M.D.

SURGERY OF THE THORAX

TRACHEA, LUNGS, AND PLEURA

Discussion of the Surgical Treatment of Dilatations of the Bronchi (Considérations sur le traitement chirurgical des dilatations bronchiques). L. DELOYERS, A. DUMONT, A. DUPREZ, H. DURIUE, and Others. *Acta chir. belg.*, 1949, 48: 609.

Thirty-six cases of bronchiectasis were observed at the Hospital Saint-Pierre, Brussels, Belgium, since the end of 1946. Two of the 36 patients were suffering from bronchiectasis which was secondary to war injuries and were refused operation. Two others were refused for other reasons, and 3 refused to submit to operation after the preparatory measures had brought marked amelioration of their symptoms. The remaining 29 underwent 30 operations, 1 patient being operated upon on both sides.

There were 5 deaths; 3 of these occurred among the first 10 patients operated upon, and 1 among the last 20 cases. Three of the 5 deaths occurred during, or immediately after, the operation. Of the 3 patients, 1 should certainly not have been operated on at all and the demise must be chalked up to experience in the early days; another was suffering from extensive amyloidosis—especially of the cardiac muscle—although the electrocardiagram had given normal results. The other 2 patients died at varying periods following the operation.

These deaths left 24 patients in whom a lobectomy or lobectomies were done and who survived long enough to afford an idea of the results to be expected. In 10 of these 24 cases a complete cure (no cough or expectoration, gain in weight and strength, reassumption of previous avocations) was not obtained; some of them are still under observation. One of the 10 patients, however, has very little trouble and may be considered as belonging to the group with excellent results.

Thus, in 15 of the patients the results could be considered excellent. The operations included 1 right superior lobectomy, 1 inferior bilobectomy on the right side, 1 inferior lobectomy on the right side, 4 inferior lobectomies on the left side, 5 inferior lobectomies on the left side with lingulectomy, and 2 complete pneumonectomies on the left side.

The age of the patient had a marked influence on the results obtained. Of the 5 patients who died, 3 had passed the thirtieth year of life. Four of those who were refused an operation were more than 35 years of age. Naturally, the older the patient, the longer, as a rule, the condition was present and the more advanced was the pathologic condition present. This, of course, suggests the possibility that the younger the patient is, the better are the results to be expected. This expectation is not dependent only upon the precocious surgical intervention having to do with a milder lesion, but also because the younger patient seems to be peculiarly resilient in the matter of the operative strain and because the young, growing tissues seem able to bring about a compensatory dilatation of the remaining pulmonary tissues.

The two principal somber notes in the prognosis have consisted of atelectasis and of postoperative bronchial fistula. Postoperative atelectasis was combated by preoperative and postoperative respiratory calesthenics, much of it based on the methods developed at the Brompton Chest Hospital in London, England. Of course, the long period of general build-up of the patient before operation had much to do with the success of the calisthenics; under the antibiotics the fetid expectoration would disappear, the erythrocytic sedimentation time would sink, and the body weight and the blood findings would be brought to practically normal.

For the operation the Overholt table, with the patient lying prone and the chest and abdomen unsupported, is now used in most of the cases. The fifth rib is resected but the other ribs are left untouched; access is obtained by means of the Finochietto rib spreader. The lobe is freed in the usual manner and the bronchial stump is managed according to the method of Sweet. The bronchus is separated from the vascular bundle and closed with 36 gauge stainless steel wire. The suture line in the bronchus is then blocked off with gelfoam and the defect closed as well as possible with the adjacent pleura of the mediastinum, but without any part of the lung, or Thompson's muscle flap technique.

After completion of the operation the adjacent intercostal nerve trunks are blocked by injecting into each nerve area 3 c.c. of novocain in oil, which frees the patient from the fear of pain on coughing. The remaining lung tissue is dilated by the anesthetist just before closure. A drain is left in for from 24 to 48 hours and the end of the tube is led down into a negative pressure bottle. The patient is encouraged to cough and expectorate early. This encouragement may result in that the patient himself removes the thick, viscid, secretions in the bronchi, which seem to be the most important factor in the development of postoperative atelectasis; however, if atelectasis nevertheless tends to develop or to persist in spite of a good cough reflex, it must be combated early and vigorously. Bronchoscopy should not be delayed. The respiratory calisthenics must be pursued industriously. The persistence of the atelectasis in spite of treatment presents a sombre prognostic picture; infection is almost sure to develop and empyema is imminent.

The other redoubtable postoperative complication is bronchial fistula. This complication has not occurred in the last series of 20 patients, and this excellent result is ascribed to the wire suturing used and the gelfoam blockage of the suture line.

This work, so near to the important nerve centers of the mediastinum, is, of course, particularly irritating to the function of the cardiovascular mechanism nearby. The studies of the authors show that the right side of the heart particularly is severely affected. The authors have been able to observe the effects on the heart especially well by watching the rate at which the venous system accepts the fluids being perfused into them from, usually, one of the veins about the malleolus or the supramalleolar region of the foot and leg. This perfusion of blood, physiologic saline solution, or glucose solution is carried out at a rate of approximately 80 drops per minute. If this perfusion rate sinks, say from 80 to 60 drops per minute or less, no attempt is made to force fluids into the already embarrassed venous circulation; analeptics and cardiac stimulants are resorted to instead.

All in all, the authors have improved results enormously by working as a closely knit team and feel encouraged to continue the study of this surgical problem which requires the interworking in a harmonious manner of so many specialties and so many and such varied techniques. The authors admit the shortness of the general period of observation of the results so far attained. A much longer period of study of the patients must be carried out before definitive results can be announced.

JOHN W. BRENNAN, M.D.

Plastic Reconstruction of Tuberculous Bronchostenosis with Dermal Grafts. PAUL W. GEBAUER. *J. Thorac. Surg.*, 1950, 19: 604.

The author presents 4 cases in which a portion of bronchus stenosed by tuberculosis was resected and replaced with an inlay dermal graft. A one year follow-up is included.

The pathogenesis of tuberculous stenosis is discussed. Due to a more intact mucosa and a smaller amount of exudate, the membranous portion of the bronchus is selected for surgical attack. This area is also more accessible.

Cases are clinically divided into 4 groups, depending upon the amount and activity of disease in the bronchus and distal lung. Progressive disease is a contraindication to surgery. Healed stenosis with quiescent parenchymal disease, or healed stenosis with active disease confined to a single lobe and adequate aeration of adjacent lobes is considered an indication for surgery. The procedure will help prevent the sequelae of obstruction to uninvolved or clinically healed lung tissue. Resection of a stenotic segment may be accompanied by resection of a badly diseased lobe.

The procedure consists of resecting the membranous portion of the bronchus containing the stenotic segment. The stenosis is thus expanded. The defect is filled with an airtight inlay graft of dermis which has been given rigidity by lacing with No. 28 stainless steel wire. In longitudinal cross section the result is a replacement of fusiform constriction with a U-shaped detour over the remaining stenotic ridge. The technique is described in detail and the postoperative course is outlined. In all cases there has been an alleviation of obstructive symptoms and no recurrence of stenosis in the short follow-up period.

ROBERT L. CRAIG, M.D.

The Treatment of Lung Abscess with Transparietal Penicillin Injections (Le traitement des Abcès du poumon par les injections transpariétales de pénicilline). P. L. DROUET, G. FAIVRE, G. DE REN, and P. SADOUL. *Sem. hôp. Paris*, 1950, 26: 359.

Endobronchial catheterization of pulmonary abscesses cannot be accomplished in numerous instances because it is technically impossible to introduce the sound into the cavity.

Five patients with lung abscesses were successfully treated by the authors with transthoracic injections of penicillin. The frequency and the number of injections depended upon the character and size of the abscess and the roentgenographic findings. From 100,000 to 500,000 units in 20 c.c. of physiologic saline solution were injected each time through a needle 10 to 15 cm. long. As a rule, after the injection of penicillin the authors introduced a few drops of lipiodol, to enable them to follow the evolution of the process roentgenographically.

The risk of any injury is minimal. Transthoracic injections of penicillin are not suggested as a substitute for endobronchial instillations. Both methods may be combined, one with another.

JOSEPH K. NARAT, M.D.

Chronic Nonmalignant Pulmonary Lesions Simulating Bronchiogenic Carcinoma. KAARE LIAVAAG. *Acta chir. scand.*, 1950, 99: 313.

Negative biopsy of a pulmonary lesion does not exclude cancer. The absence of the tubercle bacilli in a smear does not exclude tuberculosis, and findings of tubercle bacilli do not exclude cancer. Most all of the pulmonary lesions must at some time or other be differentiated from malignancy.

At Surgical Department A, of the University Clinic, Rikshopitalet, Oslo, pneumonectomy was carried out on the basis of a presumptive diagnosis of cancer in 6 cases in which other lesions were actually encountered. These cases are reported. The lesions in 2 of the cases greatly resembled the condition to which Kerschner *et al.* applied the term "chronic nonspecific pneumonitis," which is characterized by an insidious onset with a slowly progressive course. The symptoms are productive cough, chest pain, hemoptysis, and fever. Infiltration and atelectasis are seen in the roentgenogram. Bacteriological examination fails to reveal specific organisms. Bronchography shows a narrowing of the bronchial tree.

In 1 case the lesion was pulmonary tuberculosis; in 1 case, bronchiectasis; in 1 case, bronchial stenosis; and in 2 cases, chronic pneumonitis. These patients were subjected to pneumonectomy after careful diagnostic studies strongly suggested the possibility of malignancy. There were no postoperative deaths;

however, all complained of dyspnea as a result of the pneumonectomy.

In spite of all modern diagnostic methods there are still some cases in which a definite preoperative diagnosis cannot be established. As a result of this study, it has been the author's practice to perform an exploratory thoracotomy in such cases, and, if the diagnosis is still obscure, to perform a biopsy. When this does not settle the problem of diagnosis, a lobectomy is done, if technically possible, and a frozen section is examined. If this reveals cancer, a pneumonectomy is performed.

ROBERT E. FLORER, M.D.

Symptomatology and Operability of Carcinoma of the Lung, Based on the Observation of 100 Cases. Contribution to Early Diagnosis (Sulla sintomatologia e la operabilità del cancro del polmone dedotte dallo studio di 100 casi. Contributo alla diagnosi precoce). GIOVANNI MARCOZZI. *Arch. ital. chir.*, 1949, 72: 209.

Forty-three of 100 cases of primary cancer of the lung observed by the author were inoperable. In 28 of the patients an exploratory thoracotomy was performed and in 27 a radical operation was done; 2 patients refused the operation. The following symptoms were observed, in order of descending frequency: pain, cough, fever, hemoptysis, asthenia and loss of weight, dyspnea on exertion, Pancoast's syndrome, external tumefaction of the lymph glands, generalized articular pains, and expectoration of fragments of the tumor. Two per cent of the patients were asymptomatic.

The condition was mistaken by the referring physicians for rheumatic neuralgia in 23 per cent of the cases, for tuberculosis in 18 per cent, for bronchopulmonitis in 16 per cent, for a lung abscess in 12 per cent, and for pleurisy or atelectasis in 6 per cent.

JOSEPH K. NARAT, M.D.

Pulmonary Lobectomy. An Experience with 110 Consecutive Resections Without Operative Mortality. BERNARD J. RYAN. *Surgery*, 1950, 27: 551.

This report discloses the results of 110 consecutive pulmonary lobectomies on 104 men and 1 woman. Bronchiectasis (64 cases) and chronic lung abscess (20 cases) constituted the bulk of the material. Twenty-five of the patients had more than 1 lobe removed at one operation and 13 patients had 2 entire lobes removed at the same procedure, whereas 5 patients had staged bilateral lobectomies. Eleven segmental resections were performed.

The interesting feature about the report was that there were no wound infections in the entire group and 65 of the operations were completely free of any postoperative complications. There were no operative deaths, and only 2 postoperative deaths of patients with cancer, both deaths occurring only after several months had elapsed from the time of surgery.

It is concluded that pulmonary lobectomy is an extremely effective, relatively benign procedure having a surprisingly low morbidity and mortality when done by a competent surgeon.

STEPHEN A. ZIEMAN, M.D.

Pneumonectomy Followed by Immediate Thoracoplasty. ROLAND K. IVERSON and HOMER L. SKINNER. *J. Thorac. Surg.*, 1950, 19: 491.

Overdistention of the contralateral lung after pneumonectomy for tuberculosis often results in reduced respiratory efficiency and reactivation of quiescent tuberculous foci. One or two-stage thoracoplasties to avoid these complications have become routine practice in most thoracic clinics. Elective thoracoplasty is not without mortality. Thoracoplasty performed over a closed pleural space containing air and/or fluid may result in sudden increase of intrapleural pressure with fatality.

The authors believe that an extensive thoracoplasty may be performed safely upon completion of pneumonectomy, thereby eliminating the necessity for a second procedure and decreasing the period of hospitalization. Obliteration of the pleural space at the time of pulmonary resection should markedly decrease the incidence of bronchial fistula and empyema and simplify their treatment. Postoperative disturbances are minimized by the thoracoplasty, and coughing efficiency is improved.

The operative technique is cited in detail, and 10 cases of pneumonectomy followed by immediate thoracoplasty, without a death, are reported in sufficient detail to illustrate the efficacy of the operation. Seven of the procedures were for extensive unilateral pulmonary tuberculosis or tuberculous empyema, one was for pulmonary cyst and lung abscess, one was for squamous bronchiogenic carcinoma, and one patient had both squamous bronchiogenic carcinoma and active pulmonary tuberculosis.

THOMAS LANE STOKES, M.D.

Permanent Filling of the Dead Space in the Pleural Cavity After Pneumonectomy. An Experimental Study. JOHN H. GRINDLAY, O. THERON CLAGETT, and JOHN R. RYDELL. *J. Thorac. Surg.*, 1950, 19: 391.

The purpose of this experimental study was to test whether a lightweight, plastic prosthesis, approximately the size and shape of the lung, could be used to occupy the dead space left in the pleural cavity after removal of one lung.

A lightweight bag, made by heat-sealing polythene film, filled with fiber glass and air, approximately the shape of the pleural cavity, and of sufficient size to prevent mediastinal shift, was placed in the pleural cavity after right or left pneumonectomy in a series of 21 dogs. Only the outside of the prosthesis was sterile. During the early postoperative period all of the dogs were in excellent condition.

Six dogs died during the first 2 weeks because of acute empyema due to rupture of the prosthesis. Two dogs died 5 and 6 months after operation, respectively, from the same cause. Two dogs died from lesions attributed to mechanical trauma of the blood vessels adjacent to the prosthesis.

Two dogs were killed, one at 4.5 months and the other at 7 months. The mediastinum of each was in normal position and the pleura showed a minimal degree of thickening.

Nine dogs are well and have had the prosthesis in place for periods ranging from 5 to 9 months. The position of the mediastinum has always been normal in these dogs.

Eventually a leak, consisting of either a crack or rupture of the polythene covering, developed in all the polythene bag prostheses. This has permitted the air within the prosthesis to be partially or completely replaced by fluid. Although sterilizing the inside of the prosthesis and its contents would probably decrease the danger of bacterial growth in the prosthesis and of empyema, this weakness of the polythene bag makes further use of it as a prosthesis undesirable unless the defects are corrected. Recent experience with a lightweight, hollow, molded one-piece prosthesis of methyl methacrylate in a series of 4 dogs indicates that this prosthesis is superior to the one made of polythene and filled with air and fiber glass.

This study has demonstrated that the pleural cavity tolerates a large, nonirritating prosthesis after removal of the lung and that mediastinal shift can be prevented by such a prosthesis. This study and a similar one in rats have demonstrated that the prosthesis causes minimal pleural reaction, and does not lead to the formation of excessive amounts of fluid.

HEART AND PERICARDIUM

Valvular Anastomosis of the Heart Cavities. A. M. Rappaport and A. C. Scott. *Ann. Surg.*, 1950, 131: 449.

The authors present a method for by-passing either the tricuspid or the mitral valve by means of implanting the auricular appendage into the ventricular cavity. They point out that the auricular appendage is funnel-shaped, points towards the ventricle and is adjacent to it, is lined with mesothelium inside and outside and, when manipulated, does not appreciably affect cardiac action.

On the right side, longitudinal openings are cut along each border of the appendage, the ventricle is incised just at the side of the coronary vessels, the apex of the appendage is inverted into the ventricle by means of a traction suture through the apex of the auricular appendage, and the endocardium of the ventricle is then sutured to the epicardium of the auricle.

On the left side, the authors modify the procedure because of the thickness of the ventricular wall. It is necessary to mobilize the left coronary vessels near the base of the aorta and to pass the auricular appendage into the ventricular cavity just ventricular to the fibrous ring of the atrioventricular valve.

The results, as given, do not afford enough information to assess the practicality of this procedure as it has not been indicated whether or not such valve-type anastomoses remain patent after 14 days. The authors state that thrombosis will occlude the openings if continuous heparinization is not carried out immediately after operation, and that they have experienced some difficulty in that death from hemorrhage (due to the administration of heparin) has sometimes occurred; however, the valve produced by the operation functions without incompetence. All operations were performed on dogs.

Beatty H. Ramsay, M.D.

Commissurotomy for Mitral Stenosis. Robert P. Glover, Thomas J. E. O'Neill, and Charles P. Bailey. *Circulation*, 1950, 1: 329.

Since 1929, reports have appeared in the literature of 14 attempts to relieve mitral stenosis by surgical means (exclusive of cases reported in the present article). Nine patients survived the operation, but some died later of induced mitral insufficiency.

In the present series of 30 cases, 21 patients obtained satisfactory results, and 6 died.

Evaluation of cases preoperatively was based on electrocardiographic studies, sound recordings, teleoroentgenograms, esophagograms, fluoroscopy, exercise tolerance, and laboratory data on rheumatic activity. In addition, cardiac output studies were carried out, and cardiac catheterization was utilized to determine pressures of the pulmonary artery and right ventricle.

Surgical relief of mitral stenosis has included consideration of a bypass for the mitral valve. Other authors have advocated relief of pulmonary hypertension by neurectomy, the production of tricuspid regurgitation, pulmonary-systemic venous shunts, and the production of intra-auricular defects. The most efficacious method is a direct approach to the mitral valve in cases in which vegetations and scarring have not extended more than three-fourths of the way to the marginal attachments of the valves. The methods of approach to the mitral valve are: (1) incision of the valve cusp which may cause regurgitation or further scarring, (2) excision of part of the mitral ring which causes sudden regurgitation, and is not well tolerated, (3) digital dilatation which does not allow control over the point of tearing of the orifice, (4) valvuloplasty as advocated by Harken, which also produces regurgitation, and (5) commissurotomy which seems to restore valvular function best. Commissurotomy is performed through the left auricle which has been prepared by excision of the tip, and attachment of a purse-string suture through the base. With the loss of only a few cubic centimeters of blood, a finger is inserted into the atrium and the valve is located. A special knife is inserted and the anterolateral commissure is opened. If this does not offer sufficient mobility of the valves, the medial commissure may be opened. A narrow-bladed punch is used for this. The purse-string suture is then tightened and the auricular edges oversewn.

Present indications for a favorable result are included in the following grouping: (a) excessive fatigability and increasing exertional dyspnea; (b) no

rheumatic activity, normal sinus rhythm, lesion predominantly stenosis, and evidence of significantly increased pulmonary hypertension.

Less favorable results occur if recurrent bouts of hemoptysis, arterial embolic phenomena, and auricular fibrillation without failure are added to the above group.

Contraindications are (a) active rheumatic infection, (b) superimposed subacute bacterial endocarditis, (c) uncontrolled cardiac failure, and (d) associated marked mitral regurgitation or deformities of the other valves. ROBERT L. CRAIG, M.D.

Primary Myosarcoma of the Heart. Report of a Case Associated with Malignant Carcinoids and Pancreatic Heterotopia. SAUL FRIEDLANDER, GORDON E. HEIN, and JOHN C. SIEMENS. *Circulation*, 1950, 1: 797.

Among the 422 cases of primary tumor of the heart and pericardium reported, there are 89 sarcomas of different types, with only 8 rhabdomyosarcomas primary in the heart. The ages of the 8 patients with myosarcomas varied from 14 to 62 years; the duration of symptoms was from 5 days to 26 months; 5 of the patients were males and 3 were females. Symptoms in all were cardiac.

The present case of a myosarcoma primary in the heart in a 50 year old man is the ninth to be reported. The earliest clinical manifestation was precardial pain appearing 5 years before death. Later symptoms were pericarditis, changing murmurs, and transient arrhythmia. The tumor weighed 2,100 gm., and involved the heart and pericardium extensively; it probably arose from either the left auricle or ventricle, and had metastasized to the right lung, right ilium, and vertebra. The patient also had heterotopic pancreatic tissue in the jejunum, and 2 carcinoids of the ileum with metastases to the mesenteric nodes. FRANK B. QUEEN, M.D.

The Technique of Resection of Coarctation of the Aorta with the Aid of New Instruments. WILLIS J. POTTS. *Ann. Surg.*, 1950, 131: 466.

Because of the fear of hemorrhage from the aorta during resection of a coarctation, the author has devised new clamps and a vise to hold them, in order to overcome the danger of a clamp loosening during the performance of the anastomosis. The clamp utilizes the principle of the author's ductus clamp and contains, in apposing jaws, numerous fine teeth which can oppose, but interdigitate only slightly. Such jaws hold securely and damage the aortic wall very little. The use of a vise allows anastomotic suture unhurried by increasing fatigue of an assistant's fingers releasing the occluding clamps. The author has used this clamp and vise in 5 cases and each patient has had an uneventful operative and postoperative course.

Points of interest in the technique are: the use of a posterolateral incision through the bed of the fifth rib; careful and proper suture and severance of either an open ductus or a ligamentum arteriosum; use of the clamps and vise to control the aorta and to approximate the ends to be anastomosed; the use of a single No. 5-0 De Knatel over-and-over silk suture, and closure with running catgut.

The author discusses the matter of an everting intima-to-intima suture versus an over-and-over suture. He outlines the preference of several of the outstanding authorities of the day and concludes that the point has not as yet been definitely established. BEATTY H. RAMSAY, M.D.

Resection of the Preaortic Plexus in Angina Pectoris (La résection du plexus préaortique dans l'angine de poitrine). G. ARNULF. *J. chir.*, Par., 1950, 66: 97.

The value of resection of the preaortic plexus in the treatment of angina pectoris has been firmly established. The procedure is harmless and may be performed under local anesthesia on patients with or without coronary occlusion. This operation, introduced by the author, differs from sympathectomies, such as stellectomy or ramisection, because it severs sympathetic as well as parasympathetic fibers. In this manner sensory cardiac and coronary vasomotor paths are successfully interrupted. Only a portion of the extrinsic nerves of the heart, but the most important one in regard to the number, size, and distribution, is attacked by the operation. As a rule, 5 fibers are encountered. The preaortic plexus innervates the base of the aorta, the left coronary artery, and partially also the right coronary artery.

Experiments on dogs have shown that resection of the plexus is compatible with life. A transient tachycardia, with a diminution of the amplitudes of oscillations, and intact rhythm and blood pressure are observed immediately after the operation. Later on the amplitude of pulsations is augmented and the effect of mechanical or electrical excitation of the pericardium is attenuated. Vasodilatation of the coronary arteries is the main sequel of the operation.

The author prefers the extrapleural approach to the transpleural. The left second rib is resected, the internal mammary vessels are ligated, both costomediastinal leaflets of the pleura are separated, the aortic arch and the left vagus nerve are exposed, and the preaortic plexus is identified in front and below the vagus nerve. A segment of the plexus fibers, from 1 to 2 cm. long, is resected. The author stresses the necessity of resecting all fibers of the preaortic plexus. JOSEPH K. NARAT, M.D.

Aortic Vascular Rings Encountered in the Surgical Treatment of Congenital Pulmonic Stenosis. HENRY T. BAHNSON and ALFRED BLALOCK. *Ann. Surg.*, 1950, 131: 356.

In recent surgical treatment of the heart and great vessels, the authors have encountered variations of an aortic vascular ring in 40 instances. These are classified into three forms: (1) a subclavian artery which arises from the medial side of the aortic arch as the last branch, and passes behind the esophagus to the arm contralateral to the side of the aortic arch; (2) a retroesophageal innominate artery; and

(3) the persistence of both right and left embryologic fourth aortic arches. The authors discuss the embryology of the aortic arches, and describe the possibilities of anomalous structures.

In 36 cases a retroesophageal subclavian artery was encountered. These patients had had attacks of cyanosis and dyspnea, but gave no history of tracheal or bronchial obstruction. When the right subclavian artery is in a retroesophageal position, it arises from the medial side of the left descending aorta and enters the right chest behind the esophagus. In no case does this vessel pass between the trachea and the esophagus. In this position the artery is well adapted for creation of an artificial ductus arteriosus. In one instance the anomalous artery arose from the aorta and passed to the left behind the esophagus. The presence and course of the ductus was variable. In only several instances was it connected to a retroesophageal vessel.

There were 3 patients with a complete aortic ring. These cases are described.

The diagnosis of a retroesophageal artery can usually be made by a barium swallow, an abnormal appearance in the posterior wall of the esophagus being observed. In determining the type of vessel, the size and level of the indentation are important.

It is important to recognize the presence of a retroesophageal artery at the time of operation for pulmonic stenosis and to appreciate that it may be used in creating an artificial ductus arteriosus.

ROBERT E. FLORER, M.D.

Primary Tumor of the Pericardium Involving the Myocardium: Surgical Removal. LEW A. HOCHBERG and ALEXANDER I. ROBINSON. *Circulation*, 1950, 1: 805.

This report of the removal of a large (9 by 6 by 3.5 cm.) primary cavernous hemangioma of the pericardium partially enveloping the heart, and adherent to it near the vena cava, is the fifth case of cavernous hemangioma of the pericardium on record, and the first to be removed surgically. The patient, an 8 year old girl, is well 18 months later.

There are 84 primary tumors of the pericardium of all kinds among the 426 recorded primary neoplasms of the heart and pericardium.

FRANK B. QUEEN, M.D.

ESOPHAGUS AND MEDIASTINUM

Clinical and Surgical Study of Brachyesophagus. Fifty Personal Observations of "Short Esophagus" (Étude clinique et chirurgicale du brachyoesophage. A propos de 50 cas personnels "d'oesophages courts"). J. HORACIO RESANO. *Sem. hôp. Paris*, 1950, 26: 931.

Congenital brachyesophagus creates 2 important problems: diagnostic and therapeutic.

An unnecessary resection of the esophagus may be performed if the condition is mistaken for carcinoma. A false diagnosis of diaphragmatic hernia may indicate an operative lowering of the stomach, obviously without any beneficial effect. Conversely, a surgeon dealing with diaphragmatic hernia may refuse operation if he wrongly diagnoses a short esophagus.

The diagnosis is based on clinical, roentgenologic, and endoscopic findings. Four syndromes may be observed: (1) abdominal symptoms, resembling those of a peptic ulcer or cholelithiasis, (2) cardiorespiratory symptoms, such as dyspnea or angina pectoris, (3) hemorrhages, and (4) esophageal symptoms, particularly dysphagia or gastroesophageal reflux.

Five types of brachyesophagus may be distinguished: (1) congenital; (2) infantile, caused by a congenital malformation of the esophageal hiatus (the negative intrathoracic pressure aspirates the stomach into the chest cavity; the esophagus does not participate in the growth of the body, as is normally the case, when it is stretched between the cricopharyngeal attachment above and the diaphragmatic attachment below); (3) acquired; this type is attributable to a coexistence of 3 factors: vagovagal reflex, relaxation of the diaphragmatic hiatus, and ulcerative esophagitis; (4) pathologic, caused by a neoplasm or scleroderma; and (5) surgical, following resection of the esophagus or an intervention on the diaphragmatic hiatus.

Congenital brachyesophagus may have a long latent period, but sooner or later the reflux of gastric juice causes ulcerations, cicatrization, and stenosis. Less frequently an inflammatory tumor may develop. Such pathologic lesions are located in the region of the ectopic cardia. While in a congenital brachyesophagus the ulcerative process spreads from the esophagus to the ectopic cardi, in the acquired type the development of an ulcer in the cardia precedes the ectopy of the stomach.

Since the gastroesophageal reflux is the main cause of the trouble, the treatment is directed toward its elimination. Postural therapy is combined with repeated dilatations of the stenosis, and topical applications of silver nitrate, lactic acid, chromic acid, and other sclerosing agents. If such methods are unsuccessful, vagotomy is indicated in order to decrease the gastric acidity. A marked stenosis, a hemorrhagic ulcer, or an inflammatory tumor require resection. If the general condition of the patient does not allow such extensive procedures, gastrostomy may come into consideration.

JOSEPH K. NARAT, M.D.

Further Observations on Packing of the Mediastinum for Esophageal Varices. JOHN H. GARLOCK and MAX L. SOM. *J. Thorac. Surg.*, 1950, 19: 572.

Eight patients with bleeding esophageal varices were treated by the authors' method. The longest follow-up period was 8½ years. Good results were obtained in 3 cases, improvement was noted in 2 cases, and poor results were noted in 2 cases. The authors do not consider that the follow-up period is long enough in most of the cases to permit final evaluation.

In cases of portal hypertension collateral circulation between the portal and caval systems may develop via the esophageal veins. In an attempt to reroute the blood from the vulnerable submucous veins of the esophagus which develop varices, an attempt is made to produce an alternate periesophageal venous plexus by surgical means.

Through an incision along the anterior border of the sternocleidomastoid muscle, the retroesophageal area is exposed. The lateral and posterior surfaces of the esophagus are exposed and separated from the prevertebral fascia. The posterior-superior mediastinum is then packed loosely with gauze which is removed in 12 to 14 days. A venous plexus then develops in this area of foreign body reaction. This procedure alone was carried out in 6 cases. In an additional 2 cases, the retroesophageal area from the aortic arch to the diaphragm was packed in a second procedure. The mediastinum was exposed through the seventh rib bed and incised longitudinally. After packing the desired area, the gauze was brought out in a posterior stab wound, and the mediastinum was closed. The packing is removed in 10 to 14 days through the stab wound.

Brief case histories are given. It is believed that these procedures should be tried before more extensive and dangerous surgical procedures are undertaken. Development of the desired plexuses was visualized in the superior mediastinum of the 2 patients in whom the inferior mediastinum was packed.

ROBERT L. CRAIG, M.D.

Esophageal Atresia with Tracheoesophageal Fistula: Report of 6 Cases with 2 Successful Esophageal Anastomoses. RUSSELL HOWARD. *Med. J. Australia*, 1950, 1: 401.

Congenital esophageal atresia occurs in about 0.02 per cent of live births. Its treatment was unsolved until Leven constructed an antethoracic esophagus in 1939. Haight, in 1941, achieved the first primary esophageal anastomosis. Since then the outlook in this condition has steadily improved, with Swenson reporting 85 per cent survival among 32 cases of primary anastomoses in 1948. Results from several clinics are shown in Table I:

TABLE I.—RESULTS WITH PRIMARY ANASTOMOSIS

Year reported	Surgeon	Patients	Surviving	Per cent survival
1946	Haight	16	6	38
1947	Ladd and Swenson	11	4	36
1947	Gross	14	4	29
1948	Swenson	32	27	85
1949	Lam	9	3	33
1949	Ashe and Seybold	8	5	63
1949	Bigger	12	6	50
1950	Howard (Author)	4	2	50

Six cases of esophageal atresia with tracheal fistula treated surgically are described in this report. Four of the patients were treated by primary anastomosis; 2 of these survived. Two patients with nonprimary anastomoses died. On the basis of these cases the author recommends:

1. The institution of operative correction without delay.
2. Extrapleural right-side approach under general anesthesia.
3. Direct anastomosis with ablation of the fistula in one stage whenever possible, followed by a Stamm type gastrostomy under local anesthesia in one or two days.
4. Meticulous attention to postoperative care.

These patients must be treated in a hospital which is used to handling illness in young infants and they need the full-time attention of one nurse, with oxygen, frequent turns, mucus aspiration, head down position, continuous drip feeding through the gastrostomy, and penicillin and streptomycin until the tenth day, when mouth feeding is started.

FRANK B. QUEEN, M.D.

Transthoracic Esophagogastrostomy for Cicatricial Stenosis of the Esophagus in the Child and in the Adult (Oesophago-gastrostomie transthoracique pour sténose cicatricielle de l'oesophage chez l'enfant et chez l'adulte). P. SANTY, P. MAILLET, and F. MICHAUD. *Mém. Acad. cir.*, Par., 1950, 76: 59.

The authors have been doing transthoracic esophagastrostomies in cases of caustic stricture of the esophagus, not employing any startlingly new techniques, but procuring results by persistence and careful surgery. The entire operation can be finished in one session, barring, of course, the gastrostomies when an abdominal sitting must be added for the releasing of the stomach from the gastrostomy attachment to the abdominal wall.

The left pleural cavity is entered, the diaphragm incised, and the stomach brought up to the required level, with either preservation or sacrifice of the coronary artery, as the case may require. In children the stomach is much more easily mobilized than in the adult. The esophagus is more or less isolated at the level of the stricture and the permeable upper stump is implanted into the cupula of the stomach. The stomach is then fastened with sutures to the neighboring structures, a drain is inserted in the seventh costal interspace, and the patient is given sulfonamides and the antibiotics. The drain is removed by the third day as well as the Levine tube, which had been inserted during the operation as far as the pylorus.

Nine case histories are given; 3 of the cases had been reported previously. The patients' ages ranged from 2.5 years to 61 years. Although each of them presented his own special problem, all were successfully treated surgically, barring the usual small annoyances (temporary hypotension, unexplained rises in temperature, and perforation of the trachea at the level where the sealing balloon of the tracheal

catheter used for the intratracheal anesthesia was dilating the trachea posteriorly), barring an odd instance of apparent intoxication by the streptomycine administered, and, finally, barring 1 death which, however, had nothing to do with the operation itself. The patients were up by the third to the fifth day, were started on a liquid diet by the seventh day, and eventually began to eat almost everything, gained weight, and returned to a normal existence.

In this material the authors' impressions would seem of greater interest than a detailed recital of each operation. They were especially impressed by the severity and extent of the inflammatory reaction of the involved segment of the esophagus and of the tissues surrounding this area. The overlying pleural layers were always involved in adhesions, which, however, were always easily loosed. The upper dilated segment of the esophagus, above the strictured area, was hard to find as a rule and hard to liberate; this liberation was always the most time-consuming of the operative acts; in some instances this part of the procedure required more than an hour. However, the dilated condition of this part of the esophagus rendered the subsequent anastomosis with the stomach easier and more secure, the thinning of the musculature of the esophageal walls at this level being compensated for by the sclerotic changes in the contiguous tissues.

The esophagus in the earlier cases was always liberated circularly just as in cases of cancer; however, in 1 case such complete isolation of the stump for anastomosis with the stomach was not accomplished, and the results attained were apparently just as good.

On the whole, the transthoracic esophagogastrostomy appears to offer a notable amelioration in the prognosis of the grave cicatricial stenoses of the esophagus, which have up to the present offered so somber an outlook. Nevertheless, despite the immediate good results, the time is too short to speak with confidence of the remote results, especially in the matter of secondary stenosis of the neostomy.

In the discussion of this presentation by RUDLER, the question of the development of malignancy in the stenotic area of the esophagus and the consequent advisability of resecting this portion was introduced. The discussant discounts such a possibility and reports that in operating on more than 100 patients with cancer of the esophagus he has never seen a cancer originate at a point of stricture.

JOHN W. BRENNAN, M.D.

Prethoracic Esophagoplasty with Direct Esophagojejunogastric Anastomosis. Four Cases in Children (L'oesophagoplastie préthoracique avec anastomose directe oesophago-jéjuno-gastrique—4 cas chez l'enfant). BALLIVET. *Mém. Acad. cir.*, Par., 1950, 76: 73

This communication on prethoracic esophagoplasty seems a trifle out of season in view of the enthusiastic reception, even by the surgeons of France, of the intrathoracic procedure in esophageal stricture. The author's superior, Santy, does not resort to prethoracic esophagoplasty except in a few cases in which the level of the stricture is very high (in the neck). Of course, in 3 of the 4 cases discussed the stricture was not too high (upper border of aortic arch) for the use of intrathoracic procedures; however, the author regards the procurement of a properly functioning esophageal hiatus in the voluminous stomachs of children as more difficult to attain than in the case of the adult. This series of 4 cases of prethoracic esophagoplasty is therefore to be regarded as a documentation for the sake of completeness rather than as a defense of the method or a plea for its extension.

The original isolated loop of Roux is preferred for these esophagoplasties rather than the continuous loop of Wullstein for the reason that the entire blood supply available is thus reserved for the isolated section of jejunum instead of being spread out over the entire long continuous loop of the Wullstein operation. The loop is passed through the mesocolon of the transverse colon and through the lesser omentum. The lower end of this jejunal section is implanted terminally high up on the anterior of the stomach. The tube of intestine is then brought onto the anterior wall of the chest and carried upward, together with its transposed mesenteric blood supply, subcutaneously to the esophagostomy opening in the supraclavicular region. The esophageal cul-de sac is then freed from its skin attachments on the neck (to which it had been previously esophagostomized) and its edges are freshened, and a terminal implantation into the upper lateral aspect of the jejunal transplant is performed. This terminolateral esophagostomy is preferred since the pull of the mesentery on the transplant tends to curve the upper end of the jejunum while a terminoterminal ostomy would put a greater strain on the terminal arterial branches to the loop.

With this technique in 4 children (5, 12, 10, and 8 years of age, respectively) the esophagojejunal anastomosis could be established directly, once at the level of the clavicle, once above it, and twice below this level. There were no deaths and no serious complications in this material. Three temporary fistulas developed which closed spontaneously. In 1 of the children a disunion of the mesenteric border of the transplanted gut occurred and its cicatrization produced complete stenosis of the anastomotic aperture. Reintervention 6 months later, when the suprastrictural dilatation and the revascularization of the transplant had produced a more favorable terrain, permitted a completely successful re-anastomosis. More careful technique, especially with the terminolateral anastomosis, should preclude the development of these fistulas.

In 3 of these cases the functional results were excellent; in the fourth case a relative stenosis developed which has not interfered with the normal development and activity of the child, but which required a special regimen excluding bread and

meat. In the last patient the gastrostomy has not been suppressed in anticipation of a reintervention.

In all, there were 10 operative interventions in the 4 children with a total hospitalization period of 6 months, that is, an average hospitalization period of 6 weeks. The longest period was 2 months and the shortest, 1 month.

One of the 4 cases was remarkable in that there was present a double stricture, the one a short diaphragmlike closure high up just below the hypopharynx and the other about 8 cm. further down at the usual location in the chest, at the level of the aortic arch. Between these two obstructions the esophagus was perfectly normal. The oversight of this lower stricture could have been avoided by earlier roentgenograms. The upper diaphragm was excised in the first operation and the mucosal edges were united. This permitted a longer stretch of the esophageal cul-de-sac for the subsequent anastomosis.

In order to forestall strangulation of the transplant by pressure of the lower border of the chest, the author has lately been excising about 8 cm. from the last three parasternal costal cartilages. More space for the transposition may also be obtained by excision of the tip of the ensiform process.

In the discussion, RUDLER maintained that the chief problem in this type of surgery is the fistulas. He has been doing prethoracic esophagoplasties in cases of cancer. He has tried the utilization of the small intestine, of the whole stomach, of a gastric tube, and of the stomach in Y, and has found all of these methods deficient in this regard. He believes that the proper procedure is the one which exhibits the fewest fistulas, and that the energies of the profession should be concentrated on the solution of the fistula problem. JOHN W. BRENNAN, M.D.

MISCELLANEOUS

The Management of Penetrating and Perforating Wounds of the Chest in Civilian Practice. DUNCAN A. CAMERON, PAUL V. O'ROURKE, and CHARLES W. BURT. *Am. J. Surg.*, 1950, 79: 361.

The authors present a statistical review of the case histories of 119 patients who received various types of penetrating and perforating wounds of the chest and abdomen. About three-fourths of the patients were those who had received stab wounds; the remainder had gunshot wounds.

The authors emphasize the necessity for the prevention and treatment of shock attendant upon serious thoracoabdominal injuries. The incidence of postoperative complications was rather high, and indicated the extensive nature of the original injury.

Every effort was made to prevent the accumulation of blood in the pleural space by periodic aspirations. In spite of energetic efforts to maintain a completely dry pleural space, 4 of the patients required decortication because of organized hemothorax.

The treatment of pneumothorax and emphysema was carried out according to basic surgical principles. The routine use of antibiotics and the measure to maintain a dry pleural space were responsible mainly for the low incidence of empyema.

Special emphasis is placed on the subject of thoracoabdominal wounds. The necessity of realizing that both the thoracic and abdominal cavities can be involved by stab or gunshot wounds is essential in the treatment of these patients. One patient expired because the relationship of the abdominal viscera to the thorax was not appreciated at the moment. Gunshot wounds apparently caused a rather high mortality, a large proportion of which resulted from the associated damage to the abdominal viscera. ORVILLE F. GRIMES, M.D.

Thymectomy in the Treatment of Myasthenia Gravis. Results in 72 Cases Compared with 142 Control Cases. L. M. EATON and O. THERON CLAGETT. *J. Am. M. Ass.*, 1950, 142: 963.

A comparison of 72 cases of myasthenia gravis in which surgical treatment was employed with 142 control cases in which nonsurgical treatment was used showed that favorable results occurred more frequently among the surgical cases.

Further analysis of the groups suggested that factors having to do with selection of cases for surgery accounted for the better results among the surgical cases. Thus, this study failed to support the thesis that thymectomy influences beneficially the course of myasthenia gravis.

At present thymectomy in the treatment of myasthenia gravis is recommended by the authors because of the potentially malignant character of the thymomas and not because of anticipated improvement in the myasthenia gravis per se. Thymectomy is seldom recommended except when the following conditions prevail: (1) a thymic tumor can be demonstrated roentgenologically, (2) the condition of the patient is such that the risk of operation is not considered excessive, and (3) there is no roentgenologic or clinical evidence of inoperability of the tumor.

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

The Use of Tantalum Gauze in the Repair of Hernias with Tissue Deficiencies. GEORGE R. DUNLOP. *N. England J. M.*, 1950, 242: 542.

This article contains a report of the use of tantalum gauze in the repair of 10 incisional, and 51 difficult inguinal hernias. The tantalum gauze is completely described with many of its properties. It has been used in those cases of direct inguinal hernia with marked tissue deficiency, and in the large ventral hernias in which approximation of the edges is difficult. All wounds healed by primary intention and no disturbances were noted when the gauze was placed adjacent to the spermatic cord or a nerve.

The author advises careful dissection to free the hernial sac, which is ligated and amputated. The transversalis fascia is then sutured to Cooper's ligament or the inguinal ligament, if possible. The gauze is usually placed over the suture line, and is fitted about the internal ring; the cord is then placed over the wire mesh and the external oblique is closed superficially to the cord, thus maintaining the obliquity of the inguinal canal. In the case of ventral hernias, the author stresses the importance of covering the gauze with subcutaneous fat and normal skin since thin skin may slough over the wire.

Only 2 recurrences in a period of 2 years have been noted in this group, in which early ambulation and relatively early return to work were permitted. The author believes that this is a satisfactory method of repair in those cases in which additional support seems necessary. The ordinary indirect inguinal hernias were not included in this group.

THOMAS C. DOUGLASS, M.D.

GASTROINTESTINAL TRACT

Pyloric Hypertrophy in the Adult. JOHN PAUL NORTH and JAMES H. JOHNSON, JR. *Ann. Surg.*, 1950, 131: 316.

The authors have collected 59 cases of pyloric hypertrophy in the adult and have added 5 previously unreported cases. It is thought that there is probably a thickening of the pyloric muscles persisting asymptomatically from infancy, and that a complicating factor predisposes to these symptoms.

The clinical picture is not characteristic; in some patients there are mild intermittent attacks and in others complete obstruction develops with little warning. The pain varies quite a bit and is not relieved by antacids. A palpable mass was found in only 4 cases.

On x-ray examination, the lesion is difficult to distinguish from infiltrative neoplasm. There is delay in the emptying time of the stomach, but complete retention is rare. Marked degrees of hyperperistalsis or dilatation are unusual. The pyloric canal can be visualized as barium passes through into the bulb, and the canal may be concentric or eccentric, depending on the character of the hypertrophy. A mushroom deformity of the base of the duodenal bulb is probably not a reliable roentgen sign.

At surgery, a firm tumor mass, or at least a thickening, is usually but not invariably palpable. Gastrotomy is very important, because of the fact that in some cases there is no definite mass and this procedure is an aid to diagnosis. There is hypertrophy of the circular layer of muscle, and the longitudinal muscle may also show hypertrophy. There is edema of the mucosa and submucosa. The greatest thickness is at the pyloroduodenal junction.

Because of the difficulty in distinguishing this disease from cancer, surgical exploration is advocated. Various types of procedure have given uniformly good results except in cases of simple dilatation of the pylorus. Gastrojejunostomy has been satisfactory. However, Donovan has pointed out that in adults who had previously undergone this procedure for pyloric hypertrophy and were reoperated upon, the pyloric tumor remained unchanged, whereas a normal appearing pylorus is the rule after a Ramstedt pyloromyotomy. The author states: "By modern surgical standards, a limited gastric resection involves essentially no additional risk and should be the procedure of choice rather than gastrojejunostomy or pyloroplasty." Five cases of pyloric hypertrophy are presented.

ROBERT E. FLORER, M.D.

The Differential Diagnosis of Benign and Malignant Lesions of the Stomach by Means of the Flexible Operating Gastroscope. EDWARD B. BENEDICT. *Gastroenterology*, 1950, 14: 275.

An operating gastroscope has been used at the Massachusetts General Hospital, Boston, for the past year. This instrument is a modification of the Wolf-Schindler flexible gastroscope, with the addition of a side channel through which secretions may be aspirated and biopsy forceps may be introduced. Sixty-three biopsies of the stomach were obtained without accident or complication.

It appears that the most valuable use of gastroscopic biopsy is the diagnosis of lymphoma, carcinoma, and gastritis. Six typical case histories are presented to illustrate the clinical diagnostic value of gastroscopic biopsy.

The greatest value of this type of biopsy occurs when equivocal x-ray evidence exists as to whether the gastric lesion is a lymphoma or some type of gastritis and a positive diagnosis can be obtained by biopsy, or when a doubtful diagnosis of carcinoma can be confirmed by biopsy.

It appears that biopsies through the gastroscope are of little value in differentiating gastric ulcer from malignancy. The danger of perforation and the dif-

ficulty of directing the biopsy forceps to the exact spot desired limits the usefulness of the instrument.

CURTIS P. ARTZ, M.D.

Discussion: Gastroduodenal Hemorrhage as a Surgical Emergency. A. H. DOUTHWAITE, NORMAN C. TANNER, IVOR LEWIS, A. M. DESMOND, and F. AVERY JONES. *Proc. R. Soc. M.*, Lond., 1950, 43: 145.

DOUTHWAITE. It is important to differentiate between the bleeding of peptic ulceration and bleeding in cases unsuitable for surgery. Cirrhosis of the liver may be very difficult to recognize. Enlargement of the liver and spleen, although helpful when present, cannot be relied upon to save one from a diagnostic pitfall. Although bleeding in cases of cirrhosis usually comes from the varices in the esophagus, it may also come from an actual ulcer in the stomach superimposed on the chronic gastritis so frequently present with cirrhosis of the liver. Even if there is time to carry out liver tests they are extremely unreliable in a patient who has bled profusely. Furthermore, the effect of massive hemorrhage in reducing the size of the spleen might cause an otherwise palpable spleen to appear normal in size. Another common error is to diagnose peptic ulceration and hemorrhage when the underlying disease is chronic nephritis with uremia. Blood urea determination will help settle the diagnosis since an elevated blood urea from hemorrhage rarely exceeds 100 mgm. per cent, while in the azotemia due to kidney disease it will probably be higher. Other conditions which this author has seen to cause gastric hemorrhage are pulmonary tuberculosis and hypertension.

It is generally agreed that figures and opinions relating to the value of surgical or medical treatment for gastroduodenal hemorrhage are completely useless unless given with regard to the severity of the hemorrhage. Although the hemoglobin level is not an accurate guide especially in the first few hours following bleeding, the author states that any hemorrhage which has reduced the level to 50 per cent may be regarded as severe, and that if the patient is watched over the next few hours and exhibits a slow fall of hemoglobin but no further rise of pulse rate, no restlessness, and no further vomiting of blood or the passage of loose red or reddish-black stools, one can be fairly sure that the hemorrhage has been brisk but is rapidly subsiding, if it has not already stopped. With efficient medical treatment nearly all of these patients will recover. Efficient medical management implies an adequate amount of blood transfusions, fluid, and rest. It is recommended that morphine be given together with papaverine and a barbiturate by intramuscular injection. The author thinks that if for safety's sake all patients whose hemoglobin was in the region of 40 per cent were operated upon, at least 95 per cent of these operations would be entirely unnecessary and it is doubtful if they would be free from operative mortalities. It is his belief that in the case of a patient whose hemoglobin is below 50 per cent and who, in spite of the sedation, shows a persistently rising pulse rate and falling hemoglobin, surgery should be evoked promptly. If the victim could be aided before the stage of collapse and given rapid transfusion before and during operation, followed by drip transfusion after the operation, "surgical results would improve and lives would be saved." If surgery is to be done in a quiescent stage, care must be directed to the adjustment of the A/G ratio and the otherwise proper preoperative management so that the patient will be in excellent condition for surgery.

TANNER. Bleeding from operable gastric carcinoma usually ceases spontaneously; therefore the patients should be treated medically at first and then by transfusion and feeding to get them into a good enough condition for radical surgery. All the cases of gastric carcinoma in which Tanner has found it necessary to operate as an emergency measure because the bleeding did not cease spontaneously have proved to be inoperable.

In instances of portal hypertension the author uses a Rowntree balloon to tamponade the esophagus if conservative management does not stop the bleeding. In cases of portal hypertension in which there is need for an emergency surgical procedure the author performs a "transgastric portoazygos disconnection." The object of the operation is to interrupt the connection between the portal and azygos systems below the varices and thereby reduce the pressure in the varices from that of the portal to that of the caval circulation. Periesophageal venous transection alone is inadequate and impractical as an emergency proceeding. It is necessary that the emergency operation be one which can be performed through an upper abdominal incision such as that used in exploring a case of hematemesis of unknown origin. The operation then consists of the following three steps:

1. Gastric transection and resuture to interrupt the venous circulation in the stomach.

2. Division of all the vasa brevia to the upper part. This entails lifting the stomach forward after transection and dividing the occasional vasa brevia which run up the posterior wall of the lesser sac from the splenic trunk.

3. Division of the left gastric pedicle, with careful sparing of only the left gastric artery in order to preserve a blood supply to the cardiac end of the stomach, but, of course, with division of the descending branch of the left gastric artery. The author has also on 1 occasion tied the splenic artery, which reduces still further the inflow into the portal circulation. The author admits frankly that he does not know how long the effect will last since some fresh collaterals will eventually grow across the anastomosis. In the 2 cases in which he has performed this operation no ascites occurred and there had been no recurrent bleeding almost a year following the operation.

The point is stressed that even if cirrhosis of the liver is found at operation, careful search for an ulcer must be made, for such an ulcer in a hyper-

tensive medium, is prone to bleed and Tanner has performed gastrectomy for duodenal ulcer associated with hepatic cirrhosis on 3 occasions.

When bleeding is due to hiatus hernia, emergency surgery is not advisable for this condition as a rule, since the bleeding lesion is often peptic esophagitis.

Pancreatitis and carcinoma of the pancreas have necessitated emergency operations but in no case was it found that the surgery influenced the bleeding.

The author alters his technique for surgery in accord with the conditions he is dealing with, i.e., high gastric ulcer, massive gastric ulcer in debilitated patients, duodenal ulcer, gastrojejunal ulcer, or gastritis. All patients are operated upon under local anesthesia. In cases of high gastric ulcer a Pauchet modification of the Billroth I operation is performed, in which a wedgeshaped piece of the lesser curvature is removed.

When massive gastric ulcer occurs in debilitated patients and the ulcer penetrates the liver, the pancreas, or both, minimal surgical interference is considered logical. In these cases the ulcer is separated from the liver or pancreas by "pinching off," with great care not to damage the ulcer base. The edges of the large hole left in the stomach are sutured with care to make the sutures deep enough to get the whole of the ulcer edge. Two of the patients, as a result, had a stenosed stomach and gastrojejunostomy was done, but there has been no mortality in this group.

For bleeding duodenal ulcer the author now prefers to perform a gastrectomy rather than attempt to deal with the ulcer through an incision in the duodenum. He emphasizes that much experience with dissection of chronic duodenal ulcer is necessary before gastrectomy for bleeding duodenal ulcer should be attempted.

For bleeding gastrojejunal ulcer the author opens the stomach and occludes the bleeding point, and occasionally in a good risk case he performs an emergency gastrectomy. In most cases, however, he prefers to perform gastrectomy, vagotomy, or both, at a later date.

Surgery for bleeding from gastritis involves most careful palpation and inspection of all parts of the stomach before it can be decided that the bleeding is gastritic in origin. The site of ulceration may merely show a blush, or local vascularization, or a little fixity of the serosa on the muscularis. Gastrectomy is advisable in such cases with removal of four-fifths of the erosive area. If bleeding is only moderate the author prefers merely to ligate the four main gastric vessels.

LEWIS. "Patients with hematemesis should be admitted to the medical wards and the ideal combination is a keen young physician and a somewhat reluctant surgeon. . . . What we require in the management of hematemesis is a differential *prognosis* . . . to pick out certain groups where medical mortality is specially high. This has not yet been achieved." This author's rough guide is that operation should be considered in all patients over 40 years with a hemoglobin under 40 per cent, particularly if the hemorrhage recurs or there has been persistent pain.

The author's practice in chronic gastric ulcer is to perform gastrectomy with removal of the ulcer. When the ulcer is large and penetrating, its base is left *in situ* and the artery is under-run proximally and distally. In chronic duodenal ulcer the gastroduodenal artery is ligated on both sides with gastrectomy or at least exclusion. In subacute or acute gastric ulcer an elliptical resection of the ulcer is done. When the bleeding lesion cannot be found by sight or feel, the stomach should be opened and a search made.

DESMOND. Careful study of his own cases has brought Desmond to consider pain as an important factor in the decision to operate. Surgery should be considered (1) when a particularly severe bout of pain immediately precedes the hemorrhage, especially if associated with vomiting, (2) when there is radiation of pain to the back between the shoulder blades or to the shoulder tip, and (3) when pain persists after the hemorrhage.

In most cases the pain leaves almost as soon as the hemorrhage occurs. Sometimes it does not do so or the relief is but temporary and the pain recurs soon afterward.

A high blood urea is a grave prognostic sign but it is believed that this should not constitute a deterrent to surgery. This author has operated successfully on 8 patients with values over 120 mgm. per cent, 3 patients having values over 150 mgm. per cent. It is believed that a patient with severe azotemia is better able to tolerate a surgical operation under local anesthetic than to suffer a further severe hemorrhage.

JONES. The patients with frank hematemesis and melena who presented a particularly high mortality in Jones' series of over 400 cases were those of middle age who probably had a chronic ulcer and who bled again after admission to the hospital. Some of these patients had other serious medical complications which would preclude surgery, but there was a small number in whom emergency surgery might have been successful. While emergency partial gastrectomy has reduced the expected medical mortality, the surgical mortality has not been reduced since 1945. This is probably explained on the basis that a higher proportion of admissions of patients over 70 years of age has occurred since that time. Over this age, the mortality is very much increased. Under the age of 70, the mortality has declined in recent years. HAROLD LAUFMAN, M.D.

A Follow-Up Report of 102 Cases of Perforated Peptic Ulcer. CARLYLE AUGUST LUER. *Surgery*, 1950, 27: 360.

A follow-up study of 102 cases of perforated peptic ulcer showed that 21.6 per cent of the patients have remained asymptomatic. In one-half of these patients hemorrhage occurred, and in 6.9 per cent the hemorrhage was massive in character. There was a

second perforation in 10.8 per cent of the patients, and it was seen that those patients having no history of peptic ulcer prior to perforation were three times more likely to remain asymptomatic after the perforation than those who gave histories of ulcers of long standing. In younger patients, moreover, the symptoms seem to persist after perforation, whereas the older ones were freed of their distress.

STEPHEN A. ZIEMAN, M.D.

Postgastrectomy Anemias (As anemias pós-gastrectomia). JOSÉ CARLOS VINHÁES. *Brasil méd. cir.*, 1949, 11: 397.

Eighty-seven gastrectomized patients, all males, were subjected to follow-up postoperative hematologic studies from 1 to 7 years. These studies included blood examination monthly for the first 6 postoperative months. The group was selected from 281 patients subjected to subtotal gastrectomy who were seen in the period from March 13, 1941 to July 31, 1948. Of these 87 patients, 71 were gastrectomized for duodenal ulcer, 15 for gastric ulcer, and 1 for combined gastric and duodenal ulcers. When coprologic examination disclosed the presence of intestinal parasites (only 27 of these patients were free of infestation) this condition was treated preoperatively until the feces became free of the eggs; even so, it was surprising at times to find lumbrici in the intestinal lumen at operation.

Some of the patients of this group presented some postoperative anemia; however, all improved under adequate dietetic and antianemic treatment (vitamin B, iron, and liver, and gastric mucosa extracts). All were able to return to their ordinary avocations — in many instances involving heavy muscular effort—and have since continued to work unhindered except in 3 instances.

One of the afore-mentioned patients developed pulmonary tuberculosis; only 2 were rendered incapable of working because of the postoperative anemia itself. Of these 2, one had an addisonian, megalocytic type of anemia. This patient, however, had previously undergone a nephrectomy, an appendectomy, a gastroenterostomy, a cholecystectomy, and, finally, the gastrectomy. The anemia appeared 7 years after the gastrectomy. The other anemic patient presented a simple hypochromic type. He also had a positive Wassermann reaction and intestinal parasites. Following adequate treatment for the anemia and for the other conditions, the blood picture returned to normal and he recovered his strength. Both of the afore-mentioned patients are now at work and feeling well.

From his experiences with this series of cases and from his study of the literature the author concludes that the possibility of the development of a postgastrectomy anemia is not a contraindication to the subtotal gastrectomy of Reichel and Polya, or of Hoffmeister and Finsterer in cases of gastric or duodenal ulcer or of gastric cancer in cases in which these operations are otherwise indicated.

JOHN W. BRENNAN, M.D.

Diverticulosis and Acute Diverticulitis of the Jejunum. Report of 2 Cases. JOHN W. RATCLIFFE, MARSHALL K. BARTLETT, and JAMES A. HALSTED. *N. England J. M.*, 1950, 242: 387.

Jejunal diverticulosis is an uncommon finding and is equally distributed between the sexes. The patients are usually of middle or advanced age. However, the process may begin in early life, and the possibility of its being of congenital origin has been suggested by the high incidence of associated congenital anomalies. These abnormalities include Meckel's diverticulum; malrotation of the intestine, hemangioma of the liver, exstrophy of the urinary bladder, and congenital pyloric stenosis. Two cases are reported.

The first case was that of a 77 year old woman whose chief complaint was bloating and dyspepsia, with abdominal pains. The symptoms became localized in the right lower quadrant and an exploratory operation was performed, with the preoperative diagnosis of acute appendicitis. Present in the wound was a loop of upper jejunum showing multiple diverticula scattered along for a distance of about 60 cm. Their number was estimated at 50, and they varied from 1 to 10 cm. in diameter. They arose from points adjacent to the mesentery, and the walls of the larger ones were translucent and paper thin; all emptied easily on pressure. Near the center of the involved area, a 3 cm. diverticulum was acutely inflamed and fibrin-coated, and the adjacent mesentery was thick, edematous, and indurated. There was no evidence of perforation. Because of the extensive inflammatory reaction in the mesentery, a resection was not considered wise in this elderly patient. A grossly normal appendix was removed, and the abdomen was closed. She made an uneventful recovery.

The second case was that of a 36 year old woman who complained of similar abdominal distress. At operation, a mass was found in the left upper quadrant of the abdomen, consisting of omentum, jejunum, and mesentery. Nine centimeters of jejunum were resected and an end-to-end anastomosis was done. The patient developed a high intestinal obstruction on the fifth postoperative day, when a jejunostomy was performed. Recovery was uneventful. In the resected portion of the upper jejunum, multiple diverticula of various sizes were found.

STEPHEN A. ZIEMAN, M.D.

Lymphosarcoma of the Jejunum (Linfosarcoma del yeyuno). L. G. REITG PUIG, J. VILAR BONET, and F. CISCAR RIUS. *Rev. espan. enferm. ap. digest.*, 1950, 9: 65.

A woman, aged 28 years, was admitted with complaints of asthenia and abdominal discomfort not related to the ingestion of food. The patient had been well until 2 years prior to admission. Colicky pains, vomiting, and profuse diarrhea developed a few weeks before entry.

Physical examination revealed a slight meteorism, a tumefaction above and to the left of the umbilicus, and visible peristalsis. The roentgenologic study

showed considerable dilatation of the second portion of the duodenum, compression of the ascending part of the same organ, several defects in the jejunum (attributed to compression by the lymph glands), and a marked stenosis of the jejunum further down.

A presumptive diagnosis of lymphosarcoma of the jejunum, intestinal cancer, or tuberculosis of the mesenteric glands was made. A large, inoperable tumor was found between the first and the second loop of the jejunum. A side-to-side anastomosis was performed between the proximal and the distal loop of the jejunum. The patient expired the same day.

The histologic study of the tumor confirmed the diagnosis of lymphosarcoma.

JOSEPH K. NARAT, M.D.

Schwannoma of the Sigmoid; Clinical Considerations (Schwannoma del asa sigmoidea; consideraciones clínicas). EDUARDO M. BALDI. *Prensa méd. argent.*, 1950, 37: 126.

Baldi reports the case of a 55 year old female who suddenly developed acute symptoms of a lesion of the abdomen. At laparotomy a rectosigmoid tumor (schwannoma) measuring 14 by 12 by 10 cm., disclosing inflammation and necrotic degeneration, was found. The tumor was resected. Following operation she developed a septic abscess of the liver which was successfully drained surgically.

WILLIAM E. RICKETTS, M.D.

Ulcerative Colitis. H. M. EBERHARD and ROWLAND RICKETTS. *Am. J. Proct.*, 1950, 1: 30.

The discussion is limited to the etiology, proctoscopic appearance, and therapy of ulcerative colitis.

Although the specific etiology of the disease has not been definitely determined, the traditional approach to the etiologic study is under four common headings: (1) infectious causes, constitutional causes, (3) deficiency states, and (4) unknown causes. The dysentery bacillus heads the list of possible infectious causes, but it is not universally accepted as the true etiologic agent. The streptococcus and bacterium necrophorum have been assigned causative roles but presently accepted opinion places them in the ranks of secondary invaders. In the constitutional classification, food allergy, nutritional deficiency states, disturbed innervation of the colon, and psychogenic factors are included. The psychosomatic concept has many proponents. A theory of one of the authors is included under unknown causes. He feels that the same factors operating in the duodenum and causing peptic ulcer produce ulcerative colitis when operating in the large bowel.

On proctosigmoidoscopic examination, an hyperemic, glossy, edematous mucosa is seen. After swabbing, there presents a granular surface with numerous bleeding areas, all associated with excessive mucous secretion. Ulcerations may or may not be present, according to the stage of the disease. More advanced cases show a tenacious membrane with large amounts of mucopus and blood. A contracted lumen with numerous ulcers is evidence of the more chronic type. Treatment may be divided into medical and surgical therapy.

Under medical therapy is listed palliative and supportive measures, and treatment of the inflammatory process in the colon. Palliation is directed toward the control of diarrhea by bed rest, sedation, antispasmodics, and substances such as kaolin, bismuth, and hydrophilic colloids to aid in the production of a formed stool. The "medical ileostomy" of Machella and Miller, which is accomplished by inserting a Miller-Abbott tube as far as the proximal part of the lesion, may be beneficial. Total parenteral alimentation may be of value in the fulminating cases. A smooth, low residue, high protein, high carbohydrate diet with adequate vitamins and water intake is recommended. Blood and plasma should be used for the correction of anemia and hypoproteinemia. The elimination of foci of infection and the correction of any existing emotional conflicts are of paramount importance.

Several agents are mentioned for the treatment of the inflammatory process in the colon. Various serums and vaccines have been tried with questionable results. Sulfonamides, especially sulfathalidine and sulfasuxidine, have proven value and should be administered for an extended period. Streptomycin is used for the control of fever and toxicity in acute exacerbations.

Surgical treatment is usually a last resort. The surgeon rarely receives the patient in the proper physical condition for the serious surgery which the adequate management of the disease demands. If a reasonable attempt at medical management fails, surgery is indicated without delay. Complications such as perforation, obstruction, fistula, and massive hemorrhage also demand surgical management. Total colectomy, performed about 4 months following ileostomy, is suggested. Mention is made of good results in 12 selected cases observed by one of the authors, with the use of a double-barrelled ileostomy. The ileostomy remained open for 2 years, after which it was closed. All patients were in good health when seen 5 years later.

CURTIS ARTZ, M.D.

Squamous-Cell Epithelioma of the Rectum. LEO J. LEBLANC, LOUIS A. BUIE, and MALCOLM B. DOCKERTY. *Ann. Surg.*, 1950, 131: 392.

Squamous-cell epithelioma occurs rarely in the rectum and independently of the dentate line of the anus. The 5 cases reported by the authors support this belief.

Clinically, the symptomatology of these lesions is similar to that of adenocarcinoma of the rectum.

Pathologically, all 5 lesions were high grade, that is, grades 3 and 4 (Broders' classification), whereas adenocarcinomas are usually low grade, that is, grades 1 and 2. Adenoacanthomas, adenocarcinomas that imitates quamous-cell epithelioma, and metastatic lesions from the cervix uteri may be mistaken for primary squamous-cell epitheliomas of the type under discussion.

One of the 5 patients was treated with radium; however, after several months there was a full-blown recurrence and the patient was then subjected to posterior resection. In the remaining 4 patients, more or less radical operations were carried out. In the authors' opinion, surgical treatment would seem to be the treatment of choice for these lesions because they have the same possibilities of upward and lateral spread as do adenocarcinomas located in the same region.

Inguinal nodal dissection was not carried out in any of this group of patients inasmuch as no metastatic nodal involvement was clinically noted in examination of these areas. In follow-up studies, the authors observed no evidence that such involvement occurred subsequent to treatment. They realized, however, that in a series of only 5 cases, conclusions along these lines were not justified.

One patient survived for 6 years after operation and then died of recurrence. One patient died 2 years after operation, but the authors were unable to ascertain the cause of death. The third patient failed to answer a letter of inquiry. The fourth patient was alive 2 years after operation. The fifth patient was alive and well 3 months postoperatively but her lesion was a grade 3 (Broders), type C (Dukes) tumor and her outlook was not good.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Indications for Ablation of the Periparasitic Sac in the Treatment of Hydatid Cyst of the Liver. Routine Cystectomy of Suppurating Cysts of the Liver. (Des indications de l'ablation du sac péri-parasitaire dans le traitement des kystes hydatiques du foie. La kystectomie de routine des kystes suppurés du foie.) CONSTANTINI, BOURGEON, PANTIN, and RIVES. *J. chir.*, Par., 1950, 66: 177.

Eight cases of echinococcus cyst of the liver in which the cystectomy of Dévé could be successfully accomplished are reported. The authors do not try to dissect out the unopened cyst intact, but follow the usual procedures of puncture, aspiration, formolization, and wide opening of the pouch or pouches before the dissection. The left hand is introduced into the prepared pouch and the edge grasped by the little finger, the actual dissection being then accomplished against the countersupport of the index finger. The dissection is done with a curved Ollier raspatory, instead of a scalpel as recommended by the Russian authors, notably Melnikoff (*J. chir.*, Par., February, 1936). The line of cleavage is sought out as close to the enveloping liver tissues as is consistent with safety.

According to the authors the cuticular layer and the inner or germinative layer are all that belong to the parasite; the outer or pericystic layer of fibrous tissue is a defense mechanism of the liver. This is a mere membrane in cases with young nondegenerating and nonsuppurating living parasites; it only becomes thickened in the old, chronic, perhaps suppurating, process.

The possibility that this fibrous layer may contain parasitic remnants or remains capable of regeneration and producing recurrence of the echinococcic infestation is discountenanced by the authors; one of them has been looking for such remnants for the past 25 years without success, and the authors who suggest such a possibility admit that such a condition is rare.

A fact which renders this decortication operation in the old, thickened capsules easier is the large content of calcium in this layer. Such deposits in the old cases will not be demonstrated by the usual roentgenograms of the liver, but they become quite evident when the removed membrane is subjected to special roentgenography. These calcium deposits are always the most pronounced in the inner layers, close to the cuticular layer of the parasite, and actually aid in the finding of the line of cleavage near the liver tissues.

The original method of the authors is therefore followed in the early, vital processes, while excision of the sac is reserved for the old degenerating, suppurating processes. The aim of the latter operation is not, however, the same as that of the early operations—removal of possible parasitic rests—instead, it is the prevention of the long, exhausting suppurative processes incident to the usual marsupialization.

Therefore, the cystectomy of Dévé is done in all the suppurative cases, including, of course, the biliary cysts, since the biliary effusion is the incentive to suppuration. Cystectomy is also done for the old involuting cysts when an acute infection has necessitated surgical interference, and in certain multivesicular processes which are menaced with infection. Marsupialization is preferred when the cysts have opened into the biliary passages, and in patients in whom the process is enormous in size or so placed that cystectomy is impossible. If, however, the cyst be simply large, the operation is attempted anyhow, short of leaving parts of the membrane if they be deemed accessible only with danger (contiguity to large blood vessels or the bile passages). The remnants of membrane left behind will be readily absorbed.

After the cyst has been removed as thoroughly as possible or practicable, the resultant cavity is usually drained for a few days in order to remove the leucocytes and particularly any bile which has leaked out.

In 1 of the 9 cases here reported in detail, in which the operation could be done, a part of the left lobe of the liver had to be removed with the process, and the process itself had to be attacked by entering the chest cavity and passing through the diaphragm in 2 instances; yet in these cases the cystectomy could be easily accomplished and the postoperative course was simple, the patient leaving the hospital in 2 or 3 weeks. In only 1 emergency operation (in a 40 year old male) was it necessary to leave behind a considerable portion (about half) of the membrane; however, even here, marsupialization of the remain-

ing half of the sac was not done. Instead, the huge cavity was simply packed. This patient required 40 days for complete cicatrization.

From their experiences with these patients, therefore, the authors believe that the cystectomy of Dévé is superior to marsupialization in these instances in that the former procedure avoids the protracted period of postoperative suppuration with its deleterious effects both on the general condition of the patient and on the liver itself.

JOHN W. BRENNAN, M.D.

The Possibility of Hepatectomy in the Treatment of Liver Tumors (Des possibilités de l'hépatectomie dans le traitement des tumeurs du foie). J. SÉNÈQUE and R. AUROUSSEAU. *J. chir.*, Par., 1950, 66: 22.

The superiority of hepatectomy over other methods of treatment of benign tumors of the liver is stressed by the authors.

Two postoperative deaths occurred in a group of 30 patients on whom lobectomy or partial hepatectomy was performed for angina. Punctures, enucleation, or roentgenotherapy employed in similar cases furnished less satisfactory results.

In 5 patients partial hepatectomy was performed for solitary cysts. All recovered. Marsupialization, enucleation, or puncture in another group of patients with similar conditions was followed by poorer results.

Partial hepatectomy was performed on 9 patients for benign adenoma, without postoperative fatalities. One patient succumbed to a recurrence 5 years after the operation. A certain number of postoperative deaths was recorded in another group of patients after section of the pedicle or enucleation of the adenoma.

Liver function tests should be employed before the operation to appraise the condition of the liver.

JOSEPH K. NARAT, M.D.

On Reoperation for Choledocholithiasis. Experience with, and Comments on, 34 Operated Cases. ERIK MILLBOURN. *Acta chir. scand.*, 1950, 99: 285.

A rather complete study was made of a group of 34 patients who had been subjected to cholecystectomy for stones and had undergone reoperation. In 12 of the patients, no stones were found. The difficulty of diagnosis of choledocholithiasis in the cholecystectomized patient is discussed.

The clinical symptoms were listed as dyskinesia, biliary colic of a rather erratic nature, jaundice (sometimes clinical) of short duration, pancreatic involvement, and cholangitis.

In 6 patients the diagnosis was simplified by cholangiography subsequent to the gall bladder operation, which revealed the presence of calculi. Four of these patients were reoperated upon in from 2 to 15 days after the initial operation. The author believes this early procedure is not advisable because in 3 patients the postoperative course was complicated and in 1 patient death resulted.

Of 22 patients with positive stone findings who were reoperated upon, 3 died, a mortality of 14 per cent. The author concluded from this group that when in cholangiographic studies there is proof that the stones are totally cleaned out, good results are usually obtained. However, if the findings are questionable many patients will have a recurrence of symptoms.

A discussion of true stone recurrence and false recurrence, or failure to remove stones at the primary operation, is given. Two cases are mentioned in which fresh calculi were formed about silk ligatures which had migrated into the common bile duct. The formation of new stones was suspected in 5 cases.

The author has used operative and postoperative cholangiography, and believes that postoperative studies give more definite information than do operative studies.

The author points out that our methods of emptying the deep biliary passages are inadequate and that this procedure is one indication for cholangiography during surgery.

In studying the 12 cases in which no biliary stones were found at reoperation, the author concludes that the symptoms were not quite as pronounced in these patients as in those who actually had stones. He mentions the possibility of calculi having spontaneously passed into the duodenum prior to operation. In about one-half of these 12 patients, stones in the biliary passages were probably the underlying cause of the distress.

The primary mortality in the 34 operations was 9 per cent. The author stresses the use of complete cholangiography during operation and after operation.

ROBERT E. FLORER, M.D.

Study of Lütken's Sphincter of the Cystic Duct (Studio sullo sfintere colletto cistico o di lütkens. Nella cistifellea normale e nella colelitiasi). L. GURGIAN-CECCONI. *Arch. ital. mal. app. dizer.*, 1949, 15: 349.

Disturbances of motility of the extrahepatic biliary tract are related to (1) increase, diminution or loss of contractility of the gall bladder, (2) increase or decrease of the tonus of the sphincter of the cystic duct, (3) increase or decrease of the tonus of the sphincter of Oddi, or (4) disturbance of normal relations between the motility of the gall bladder and the function of the sphincters.

The author studied the structure of the sphincter of the cystic duct. Material for the study was obtained from autopsies of 18 individuals who died from diseases not involving the pancreas, the liver, or the extrahepatic ducts, and of 15 patients with gallstones.

Serial sections of the duct were made in longitudinal as well as transverse direction. Their study confirmed Lütken's findings, i.e., they demonstrated the presence of circular muscular fibers forming a sphincter.

In a certain number of patients with gallstones, the sphincter was atrophic or sclerotic. The author

assumes that such changes constitute the main cause of biliary stasis and thus may be considered a contributory factor in the genesis of cholelithiasis.

JOSEPH K. NARAT, M.D.

The Malady of the Sphincter of Oddi. Analysis of 70 New Observations Made During the Period from December 7, 1945 to July 5, 1949 (Maladie du sphincter d'Oddi. Analyse de 70 observations nouvelles recueillies du 12-7-45 au 7-5-49). P. MALLET-GUY, J. FEROLDI, and F. MICEK. *Lyon chir.*, 1950, 45: 33, 181.

One of the authors, with collaborators, had already reported 34 observations of this disease in 1945 (*Lyon chir.*, 1945, 40: 553). With this new group of cases an attempt is made to discuss only such matters as have caused a modification of the views expressed in the earlier publication. Such material as is concerned with stone in the common duct of purely mechanical causation is here omitted.

On the basis of preoperative manometric and cholangiographic studies the malady of the sphincter of Oddi is now regarded as being initially of a purely functional nature; there is at first a spasmodic state of the entire biliary tract. Later, the remainder of the bile tract returns apparently to its normal state of tonicity, but leaves the sphincter of Oddi in a more or less permanently functionally contracted condition. With the passage of time the sphincter becomes chronically sclerosed and immobile.

On the basis of 26 biopsies performed on the sphincter of Oddi it was found that the muscular ring becomes at first hypertrophic, then the developing sclerotic connective tissues invade the muscle itself, separating its bundles. Eventually also interspersed among the muscle bundles will be observed glandular structures. These the authors interpret as an adenomatous proliferation of the glands of the superjacent corium. At times suspicious changes of degenerative character are seen in the intramuscular nerve ganglia.

In more than 10 per cent of the authors' cases there were also alterations in the gall bladder and cystic duct. These changes might assume the character of a banal lithiasis of the gall bladder, or progress as an acute, or a chronic, cholecystitis. The sphincter of Luschka, of course, shares in the spastic state of the entire biliary tract and returns with it to normal as a rule; however, it may remain permanently contracted or share, or alternate, periods of contraction and spasticity with the sphincter of Oddi. In fact, under the stress of spasticity the sphincter of the cystic duct would seem to develop sclerotic changes earlier and more severely than the sphincter of Oddi. However, histologic details are lacking as the conditions here described do not provide indications for cholecystectomy.

Although the etiologic factors in this condition are not at all well understood, a few have nevertheless been incriminated. Such are the diverticulum in the region of the ampulla of Vater, duodenal ulcer, and pulmonary tuberculosis. It is obvious, of course, that the latter two etiologic factors could act through a form of vagal irritation. In fact, infiltration of the vagus will differentiate between the early functional and the later sclerotic phases of the disease. Vagotomy may be valuable as a form of medical treatment for this condition; it should be bilateral.

Since the symptoms of malady of the sphincter of Oddi are not so different from those of stone in the common duct, the diagnosis will usually depend ultimately on the roentgen findings, particularly on the preoperative manometric and cholangiographic methods developed by the authors of the Lyon school of surgery. The sclerosed sphincter will frequently be felt at operation through the wall of the duodenum as a hard granule, and this must, of course, be distinguished from tumor of the ampulla of Vater.

In the event that the contracture of the sphincter has become fixed by sclerotic changes, a transduodenal sphincterotomy would seem to be preferable to a choledochoduodenostomy.

JOHN W. BRENNAN, M.D.

Histopathologic Study on the Retention of Bile (Étude histopathologique de la rétention biliaire). J. CAROLI, A. PARAF, J. ETÉVÉ, E. HERTZOG, and Others. *Sem. hôp. Paris*, 1950, 26: 743.

For many years pathologists have disagreed on the question whether icterus, be it of intrahepatic or extrahepatic origin, is always accompanied by characteristic histologic changes, and whether the histologic picture in the hepatic bile system is different in hepatitis from that in obstructive icterus.

The authors studied a series of 50 liver biopsies, half of which were taken from patients with hepatitis, the other half from patients with stenoses of the ductus choledochus. The authors were able to show that ectasia of the intralobular bile canaliculi and stasis of bile were present in all cases, not regarding the nature of the icterus.

The bile retention is caused by mechanical obstruction at the periphery of the lobule. Except for hemolytic icterus, all forms of clinical icterus show intralobular cholestasis and extreme ectasia of the capillary ducts, which are plugged by a highly concentrated bile. Since these signs are identical in intrahepatic and obstructive ileus, biopsies of the liver do not help for differential diagnosis.

Many writers did not find this intralobular cholestasis. The authors believe that this was due to a faulty technique in the preparation and staining of the cuts. As almost all histologic procedures make use of solutions which dissolve the bilirubin, the bile thrombi are destroyed or made irrecognizable by the usual methods. The best results are obtained with the Stein staining method which uses a modified Lugol's solution. Detailed instructions are given for preparing and staining the cuts.

The authors believe that the current theories of canaliculointerstitial rupture or rupture of the ampullae are erroneous and that the correct interpretation of the histologic picture is retention of bile and obstruction of the canaliculi. This theory is

further confirmed by the beneficial effect of duodenal drainage to remove the retained bile in certain cases of hepatitis. WERNER M. SOLMITZ, M.D.

Pathogenesis of Acute Hemorrhagic Pancreatitis. JOSEPH GASTER, ALEXANDER BLAIN, III., and KENNETH H. CAMPBELL. *Arch. Surg.*, 1950, 60: 473.

The authors review the literature (historical and experimental) on the pathogenesis of acute hemorrhagic pancreatitis. The question of conservative therapy versus operative therapy is avoided. The low calcium value is believed to be due to the combination of calcium with fatty acids formed by the action of pancreatic lipase or fat. Since this occurs when pancreatic necrosis has occurred, it is believed that the calcium level may differentiate necrosis from edema of the pancreas, and this should be of prognostic significance. JOHN H. KAY, M.D.

Heterotopic Pancreatic Tissue. Report of a Case Presenting Symptoms of Ulcer, and Review of the Recent Literature. J. MAX BUSARD and WALTMAN WALTERS. *Arch. Surg.*, 1950, 60: 674.

A case of heterotopic pancreatic tissue is presented in which the lesion is classified as being of the adenomyoma type. With the presentation of this report, a total of 543 cases of this condition have been found in the literature.

The location of heterotopic pancreatic tissue has been noted in the stomach, duodenum, or jejunum in about 70 per cent of the cases. In the series reported by the authors, 72 per cent of the lesions were found in these regions. About a fourth of these heterotopias have been found in the stomach, and in this regard the lesion in our case presented in a common site.

Recently, the question of etiology has not been further elucidated, but it is interesting that the authors' case was illustrative of the coexistence of diverticula and heterotopic pancreatic tissue.

Pathologically, this case presented the type of lesion referred to by Clarke as an adenomyoma, inasmuch as no pancreatic acini were recognized per se; rather, the picture was microscopically that of Brunner's glandular acini and ducts, surrounded by smooth muscle.

Comments in the later literature with regard to the possible pathologic complications which may occur include cyst formation, acute and chronic pancreatitis, hemorrhage, necrosis, abscess formation, atrophy, pyloric and biliary obstruction, multiple tumors, malignant degeneration, endocrine functioning, or any change which may occur in the anatomic pancreas. Changes in the aberrant pancreatic tissue synchronous with identical changes in the anatomic pancreas have been noted.

No clarification of the symptomatology of this condition has been evolved, as testified in the recent literature by emphasis on ambiguity or the absence of clinical features. However, it has frequently been noted that symptoms of peptic ulcer may be simulated.

In accord with previous reports on the treatment of this condition, surgical exploration was performed and intervention consisted of gastroduodenostomy preceded by local excision of the lesion.

The complications arising from the lesion in one case were those of partial obstruction by possible prolapse of the tumor through the pylorus, and symptoms of peptic ulceration. In recent literature, besides frequent reference to peptic ulceration, mention has been made of gastroduodenitis, carcinomatous degeneration, hyperinsulinism, hemorrhage, obstructive jaundice, intussusception, obstruction, and even death.

The prognosis is held to be good in cases not associated with the foregoing complications, though cases have been observed in which the symptoms continued despite excision of the lesion.

MISCELLANEOUS

The Possible Relationship Between Abdominal Adenitis, Appendicitis, Tonsillitis and Glandular Fever. K. F. M. UTTLEY. *N. Zealand M. J.*, 1949, 48: 540.

The relationship of appendicitis and abdominal lymphadenitis is discussed, and evidence is presented which indicates that appendicitis arises as a result of obstruction of the lumen following hyperplasia of its lymphoid tissue as part of a more generalized hyperplasia.

It is suggested that tonsillitis, and cervical and thoracic adenitis should also be regarded as a localized manifestation of this hyperplasia and that the virus that causes glandular fever may, in a certain proportion of cases, be responsible for all these conditions.

The main difficulties in accepting these conditions as manifestations of glandular fever are that they may often show apparently no mononucleosis, sometimes no palpable lymph nodes, and not infrequently a Paul-Bunnell titer which is not at a diagnostic level. Even in the more classical types of the disease there is a great variation in the time of the appearance of the nodes, the duration of their enlargement, as well as their size and their distribution. There is a similar variation in the occurrence of mononucleosis; and instances of polymorph leucocytosis, normal count, and low white count are all described.

The author believes that the accumulated evidence supports his concepts that most cases of tonsillitis, abdominal lymphadenitis, appendicitis, some cases of benign lymphocytic meningitis, atypical or virus pneumonia, and the various combinations of these syndromes which have been described should be linked together and regarded as different manifestations of the one disease process. If the Paul-Bunnell test is specific, then the common underlying cause of a number of these cases must be the virus of glandular fever. If the Paul-Bunnell test is not specific, there appears to be a clinical relationship between these conditions which has been hitherto neglected, and it is possible that other viruses are

concerned in the more or less generalized lymphoid hyperplasia.

If these conditions are studied from the point of view that they are probably related—for instance, if Paul-Bunnell tests are done routinely in the various syndromes, if roentgenograms of the chest are taken in cases of lymphocytic meningitis, if "meningism" in atypical pneumonia is fully investigated, and if particular attention is paid to the instances of abdominal pain in conditions not chiefly affecting the abdomen—then further evidence which will confirm or refute the theory formulated in this paper should not be long in accumulating. The final decision will, of course, depend upon the discovery of the etiological agent.

It appears to be dangerous to dismiss abdominal pain as due to abdominal adenitis, without adequate supervision if appendicitis should supervene, and this is particularly important if abdominal pain arises during glandular fever, acute upper respiratory infection, and exanthemas.

ORVILLE F. GRIMES, M.D.

Primary Retroperitoneal Tumors. A Summation of 33 Cases. HARRY R. NEWMAN and BERNARD D. PINCK. *Arch. Surg.*, 1950, 60: 879.

Primary neoplasms of the retroperitoneal space may be classified as follows: (A) cystic tumors—(1) dermoid, (2) teratoid, (3) developed from wolffian body, (4) developed from muellerian duct, (5) lymphatic, (6) traumatic, and (7) parasitic; (B) solid tumors—(1) benign—(a) lipoma, (b) fibroma, (c) leiomyoma, and (d) lymphangioma; (2) malignant—(a) liposarcoma, (b) myxosarcoma, (c) fibrosarcoma, (d) neurosarcoma, (e) lymphosarcoma, (f) Hodgkin's disease, (g) carcinoma, and (h) undifferentiated sarcoma; and (3) undifferentiated tumors.

Thirty-three proved cases of primary retroperitoneal tumors are reported. Fifty per cent of the cases occurred in the fifth and sixth decades, 25 per cent in the third and fourth decades, 15.9 per cent in the first 10 years of life, and the remaining 9.1 per cent occurred after the age of 70.

Sixteen per cent of the tumors were benign, mainly lipomas. Eighty-four per cent were malignant, the most common types encountered being lymphosarcomas, undifferentiated tumors, neuroblastomas, lymphoblastomas, neurofibromas, undifferentiated sarcomas, spindle cell sarcomas, and leiomyosarcomas.

The chief complaint is usually vague gastrointestinal disturbance. In the late stages of the disease, the predominant symptoms result from the invasion of the surrounding structures by the tumor. The diagnosis is difficult. In 53 per cent of the series, the x-ray findings in the gastrointestinal tract and retrograde pyelography were sufficient for a diagnosis to be made. The correct preoperative diagnosis was established in only 37 per cent of the cases.

All of the patients were subjected to an exploratory operation. In 12 cases, total excision of the tumor was surgically effected; the remaining patients were found to have inoperable tumors. Radiation therapy was given in some of the operable cases and in most of the inoperable ones. The best results were obtained in those patients in whom total excision of the tumor was performed.

SAMUEL KAHN, M.D.

GYNECOLOGY

UTERUS

Studies on the Contractility of the Uterine Body, Isthmus, and Cervix Under Normal Conditions During Pregnancy and in Labor. JOHN NAESLUND, OLLE SNELLMAN, ARPAD CSAPO, and TOMAS ERDÖS. *Acta obst. gyn. scand.*, 1950, 29: 291.

The behavior of uterine musculature during pregnancy, particularly the fact that the isthmus in labor remains passive whereas the body contracts violently and effectively, is a problem that has been debated in obstetrical literature. Two proteins, actin and myosin, have been isolated from the muscles of various animals. Neither of these substances are contractile, but they have the power of combining in certain proportions to form a new substance, actomyosin, which is contractile in the presence of adenosintriphosphate.

Sections of myometrium in both the uterine body and the isthmus were made to show the presence of actomyosin threads in order to study their contractility. It was found that in the nongravid uterus the contracting time of both the body musculature and the isthmus was prolonged (10 minutes). During pregnancy the contracting time of uterine musculature seems to have increased. There was no increase noted in the isthmus of gravid uteri. During labor the contractility of the body musculature was tremendously increased while that of the isthmus remained the same.

The actomyosin and myosin contents of both the body musculature and the isthmus were also determined by the method of electrophoresis and Swedberg's ultracentrifuge. Similar results as those described were noted. JOHN R. WOLFF, M.D.

Rupture of the Uterus. G. LESLIE WATT. *Am. J. Obst.*, 1950, 59: 490.

A group of 15 cases of rupture of the uterus occurring in the Toronto General Hospital during the 20 year period from 1927 through 1946 has been studied and serves as a basis for clinical discussion.

Spontaneous rupture occurred in 1 patient. It would occur much less frequently if pituitrin were used more wisely and if obstetricians were more alert to the dangers of relative disproportion in multiparous patients. Slightly less conservatism with regard to cesarean section is advocated.

The number of manipulative ruptures with their extremely bad results could be materially reduced if the complication leading up to the manipulation were recognized earlier and cesarean section done. Version and breech extraction are condemned, and when difficult manipulative deliveries have taken place the whole of the uterus should be explored. If rupture is found, transfusion and laparotomy should be resorted to at once. Nine such cases are described, all in multiparas. Three mothers and 8 fetuses died.

"Once a cesarean always a cesarean" is undoubtedly the safest rule to follow. Any continued deviation will eventually result in the rupture of a scar, which would place the mother's life in jeopardy and cause almost certain death for the child. Because of the very high incidence of previous classical cesarean sections in any series of ruptures of a previous scar, low cervical section should be done exclusively whenever this operation is indicated.

GEORGE BLINICK, M.D.

Primary Uterine Malignancy. J. EDWARD HALL, JOHN PEPE, and JOHN TORTORA. *Am. J. Obst.*, 1950, 59: 634.

An analysis covering 189 cases of primary malignancy of the uterus treated at the Brooklyn Hospital from 1935 to 1946 is presented. Ninety-eight cases involved the cervix and 91, the corpus. Sixty-nine patients with cancer of the cervix and 62 with cancer of the endometrium were used to determine the survival rates. The 5 year survival rate for cancer of the cervix was 40.8 per cent and for cancer of the corpus, 70 per cent.

Patients with cervical cancer sought medical advice sooner than those who had corporal cancer. The histologic grade of the cancer had very little influence on the survival rates in cancer of the cervix, but the stage of involvement was found to be all-important.

"Contact" intravaginal roentgen ray therapy has been an important adjunct in the treatment of cervical cancer. The most important phase in the treatment of endometrial cancer was hysterectomy, but higher survival rates were obtained when radiation was combined with hysterectomy.

GEORGE BLINICK, M.D.

Carcinoma of the Cervix. J. H. RANDALL, W. C. KEETTEL, H. C. WILLUMSEN, and J. W. SCOTT. *Am. J. Obst.*, 1950, 59: 285.

Of 983 patients with cervical carcinomas, 30.4 per cent survived (5 year cure) following treatment with irradiation therapy at the State University of Iowa Hospitals, Iowa City, Iowa. During the years from 1926 to 1937, the absolute 5 year survival rate was 25.7 per cent, but increased to 37.0 per cent for the years 1937 to 1942. This marked improvement in end results is due to improvement in the technique of treatment.

The histologic character of carcinomas of this type has little effect upon the final results. Patients who are young or senile, and those who are febrile, or have an inverting type of growth generally respond less well to irradiation.

Complications are inevitable when irradiation is given to the limits of tolerance, and there is a definite primary mortality of from 1 per cent to 2 per cent following such treatment.

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The end results from combined x-ray and radium treatment of cervical carcinoma have been as good as, if not better than, those reported from surgery. Since the most important single factor in end results is the stage of the disease, more emphasis should be placed upon the early diagnosis of carcinoma.

JOHN R. WOLFF, M.D.

ADNEXAL AND PERIUTERINE CONDITIONS

The Structure and Function of the Cortex of the Human Ovary. OTTO H. SCHWARZ and CLAUDE C. YOUNG, JR. *Am. J. Obst.*, 1950, 59: 820.

The cortex of the ovary develops from birth, and reaches its fullest extent around the twentieth year. It is almost entirely made up of tissue similar to that of smooth muscle, and has a very close relationship to the media of the blood vessels. This indicates that these structures may be the source of the developing cortex.

CHARLES BARON, M.D.

Anatomoclinical Contribution to Our Knowledge on the Subject of Defeminizing and Masculinizing Tumors of the Ovary (Contributo anatomo-clinico alla conoscenza dei tumori defemminilizzanti e mascolinizzanti dell'ovaio). EUGENIO LENZI. *Riv. ital. gin.*, 1949, 32: 383.

Two cases of ovarian tumor are reported. The one was a typical arrhenoblastoma as described by R. Meyer in 1932 and the other was an example of masculinovoblastoma, a term proposed by Rottino and Mc Grath (*Arch. Int. Med.*, 1939, 63: 686). The arrhenoblastoma is what is referred to as masculinizing and the masculinovoblastoma as defeminizing.

The patient with the arrhenoblastoma was 18 years old. Her first menstrual period occurred at 11 years but the periods ceased after a year and did not recur for 6 years, and then only after a vigorous and long continued period of folliculin and lutein treatment. About 6 months preceding her admission to the hospital the family began to note a certain masculinizing change in the patient; 2 months before admission the menstrual bleeding again ceased, and shortly before admission the patient began to experience severe pains in the lower abdomen.

Physical examination disclosed a tall individual with numerous evidences of defeminization; the features were rather acromegalic in appearance, the shoulders broad and square, the mammae atrophic, the hips narrow and masculine in contour, and the fat distribution was of the masculine type. The limbs were hairy and the pubic hair disclosed the usual masculine distribution. The patient had been married a year to an apparently healthy male but had never been pregnant.

Examination of the genital organs uncovered a notable hypertrophy of the clitoris. The uterus was small and was pushed forward by a tumor the size of a fetal head, which was apparently attached to its posterior surface.

Laparotomy exposed a tumor the size of a 4 months' pregnant uterus and presenting some adhesions to the surrounding peritoneal pelvic surfaces. The mass was partly solid and partly soft. At some points the capsule showed a tendency toward erosion and to fall apart with the least stress. The uterus and right tube and ovary seemed to be uninvolved and were left *in situ*.

The patient expressed indifference for the opposite sex and heightened erotism for her own. She had to be watched constantly while in the hospital. She menstruated while in the ward and continued to do so at irregular intervals after leaving. Although some months later she claimed loss of attraction for her own sex and some attraction for the male sex, the secondary masculine characteristics did not change much, and the pains had returned. Re-examination disclosed a tumor of about the same size as, and somewhat more firm than the previous neoplasm, in about the same place.

Laparotomy showed that this mass had developed in the broad ligament of the left side of the pelvis. This time the uterus and healthy tube and ovary were removed with the tumor mass. The patient died at home about 6 months later.

Histologic examination brought to light only the usual findings of the typical arrhenoblastoma, that is, sarcomatous cells in a meager but very vascular connective tissue stroma and with an admixture of what appeared to be typical interstitial cells of Leydig which are, of course, typically related to the male testicle.

The patient with the masculinovoblastoma was 20 years of age, again a nullipara, and had always been fairly healthy until 3 years previous to hospital admission. At that time the menstrual periods began to exhibit irregularities. Lately there had been complaints of pain in the right iliac fossa and the patient had begun to lose weight.

The family stated that the patient had always shown childish preferences and she herself admitted lack of interest in the opposite sex. The secondary sexual characteristics were poorly developed, the body hair was scarce or absent, and the sexual organs were small, and with infantile characteristics. There was a palpable mass, apparently attached to the right ovary. It was a firm, rather fixed, nodular tumor, larger than a fetal head at term.

The tumor was removed together with the attached right ovary and tube, and the uterus and other adnexa were left *in situ*. The cut surface of the mass exhibited a peculiar sulfur-yellow color. When the patient returned for a check up 2 months later, the menstrual periods were still somewhat irregular; however, the secondary sexual characteristics had begun to develop; the hair had become more luxuriant and assumed the female type of distribution. A year later the patient had put on weight, her disposition had assumed an emotional feminine trend and she admitted an attraction toward the opposite sex.

Histologic examination of the removed specimen exhibited findings typical of the masculinovoblastoma. There were large quantities of intracellular

and extracellular lipids, and the glandular cells of the tumor were apparently in full functional activity when removed.

The author believes that the arrhenoblastoma was in an advanced phase of its functional activity, while the masculinovoblastoma was caught at operation in an early phase, before its masculinizing effects had had time to develop. Thus, its symptoms were considered to be those of a simple defeminization.

With regard to the pathogenesis of these two neoplasms, the author's observations are regarded as more or less substantiating the findings and theories expressed by Lalla Iverson (*Surg. Gyn. Obst.*, 1947, 84: 213). JOHN W. BRENNAN, M.D.

A Contribution to the Study of Malignant Connectivomas of the Tube, With Reference to a Case of Sarcomatous Reticuloendothelioma (Contributo allo studio dei connettivomi maligni della tuba). FRANCESCO GUERCIO. *Ann. ostet. gin.*, 1949, 71: 608.

After reviewing available reports of malignant connectivomas of the tube, a case of sarcomatous reticuloendothelioma is presented. The clinical picture is summarized, along with the gross microscopic findings. EDITH B. FARNSWORTH, M.D.

Primary Tubal Carcinoma with Metastasis to the Endometrium and the Mesovarium. HARALD OLESEN and VILHELM ALBECK. *Acta obst. gyn. scand.*, 1950, 29: 246.

A case is reported of primary tubal carcinoma in a 47 year old woman whose only symptom was an uncharacteristic metrorrhagia.

Microscopic examination of the endometrium, removed by curettage, showed carcinoma confined to one small particle of a somewhat hyperplastic uterine mucosa. On the diagnosis of carcinoma of the corpus uteri total extirpation of the uterus and both adnexa was done, and the pathologic examination revealed the case to be one of left tubal carcinoma with metastasis to the endometrium and the left mesovarium. Furthermore, endometriosis of the left ovary, a cystic right ovary, chronic salpingitis on the right side, and a small fibromyoma in the uterine wall were found. CHARLES BARON, M.D.

EXTERNAL GENITALIA

A Case of Solitary True Papilloma of the Vulva (Su un caso di papilloma vero solitario della vulva). GIUSEPPE SERRA. *Riv. ital. gin.*, 1950, 33: 36.

True papilloma of the vulva is a very rare condition.

A pedunculated tumor, the size of an orange, was found in a 24 year old virgin on the lower margin of the urinary meatus. The surface was plicated, the color was gray, and the consistency soft. The tumor contained a cyst with a whitish, viscous fluid. Histologic examination established the diagnosis of a true papilloma. The Kahn reaction was negative, and no gonococci were found in the vaginal smears.

Two groups of papilloma of the vulva may be distinguished: (1) solitary, true papilloma, and (2) condyloma acuminatum.

JOSEPH K. NARAT, M.D.

Clinicostatistical Considerations on the Subject of Carcinoma of the Vulva (Considerazioni clinicostatistiche sul carcinoma della vulva). G. BIANCHI. *Riv. ostet. gin.*, 1948, 3: 405.

Twenty-six carcinomas of the vulva form the basis for this evaluation of the usual methods of treatment for this extremely malignant condition. Three of the patients were nulliparas. Of the 23 multiparas, 3 had given birth to 2 children, 2 to 3 children, 4 to 4 children, and the remaining 14 had all had more than 5 children.

The material here presented represents 4.7 per cent of the 542 malignant tumors of the female genitalia, and 0.28 per cent of the total number of gynecological patients observed during the past 12 years at the Obstetrical and Gynecological Clinic of the University of Parma, Italy.

Of these 26 vulvar neoplasms, 5 were treated by roentgen therapy, associated in 2 instances with radium therapy, and all of the patients died within a few months.

Of the remaining 21 patients, 3 were subjected to vulvectomy and were subsequently given roentgen therapy despite the fact that there were no signs of glandular metastases at the time of operation. Of these 3 patients, 1 is well after a 5 year interval, 1 died 2 years later, and 1 has not been heard from.

Of the remaining 18 patients, 5 underwent a simple vulvectomy, since (with the exception of 1 patient) there were no clinical signs of glandular involvement. The patient mentioned as the exception suffered a recurrence of the neoplasm in the operative scar 4 years later. The scar had already passed into a state of leucoplastic transformation. This patient died 2 years after the appearance of the recurrence. Of the remaining 4 patients, 1 died after 7 months of an unspecified cause, 1 died later of intercurrent affection, the third is alive and well 3 years later, and the fourth patient now, 2 years later, presents enlargement of a lymph node.

Of the remaining 13 patients, 5 were treated by vulvectomy accompanied by bilateral removal of the inguinal lymph glands en masse. Of these, 2 died in the course of the first year following the operation; the remaining 3 are alive and well for periods of 12, 4.5, and 3 years, respectively, after the operation.

Of the remaining 8 patients, 1 was subjected to vulvectomy with excision of the tissues of both inguinal regions and a subsequent course of roentgen treatments. This patient, however, died after 3 months. A second underwent vulvectomy with exploration and removal of the tributary lymphatics after the method of Taussig and Basset. This patient died on the seventh postoperative day, the experience only confirming in the author's mind the danger of immediate operative mortality with this radical procedure.

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Two patients were given no treatment at all and both of these died within the month of entering the hospital.

Of the remaining 4 patients, 1 refused all treatment, returned home, and died 3 months later. The remaining 3 are under treatment with large dosages of hormones. However, the period of treatment has been too brief to admit of evaluation.

The experience afforded by this material leads the author to the conclusion that none of the therapeutic methods here mentioned offer a great deal of encouragement. He is therefore of the opinion that the greatest improvement in results for the future is to be anticipated from the earlier diagnosis of the malignant lesion itself, and from the treatment of the precancerous lesions of this region with such means as we have at our disposal. He recommends that the efforts of the profession be directed toward these two goals. JOHN W. BRENNAN, M.D.

A Clinical Evaluation of 3,500 Vaginal Cytologic Studies. NORBERT B. REICHER, BARBARA W. MASSEY, and ELEANOR BECHTOLD. *Am. J. Obst.*, 1950, 59: 860.

Analysis has been made of 3,500 vaginal cytologic studies and of clinical follow-ups, tissue follow-ups, or of both of these cases. Eighty-five cases of carcinoma of the uterus, cervix, vagina, or vulva were discovered. In 18 cases of adenocarcinoma there were 13 positive smears and 5 negative ones, yielding a false negative error of 27.8 per cent. In addition, 6 smears were mistakenly called adenocarcinoma, a false positive error of 31.6 per cent. In 67 cases of squamous carcinoma, there were 4 false negative smears, a false negative error of 5.9 per cent, and there were 11 false positive smears, an error of 14.9 per cent. In all, 9 smears were erroneously called negative, a total negative error of 10.6 per cent. On the other hand, 17 smears called positive were proved incorrect, a total false positive error of 18.4 per cent. The combined error for the entire series is thus 26 of 3,500 cases, or 0.74 per cent. An attempt has been made to show that the statistical picture presenting the results of a controlled study of vaginal smears often falls far short of representing the true value of the technique to the clinician and the patient.

Based upon the clinical evaluation of 3,500 vaginal cytologic studies and the experience of others obtained from the literature, the vaginal smear is a valuable adjunct in the diagnosis of pelvic disease. It is helpful both in the malignant and nonmalignant conditions, but it in no way has come to be used as a substitute for the routine pelvic examination, biopsies, and curettage when indicated. The follow-up of postirradiation malignancies appears to be another value of the vaginal smear, as well as the occasional incidental detection of a carcinoma in an otherwise clinically benign case. Up to the present writing, the vaginal smear has not been, and will not be, the basis for gynecologic surgery, or the reason for not employing surgery until all other diagnostic criteria have been met. CHARLES BARON, M.D.

A Rare Case of Cavernous Lymphangioma of the Vagina with a Partial Aspect of Endothelioma (Rara osservazione di linfangioma cavernoso della vagina con parziali aspetti endoteliomatosi). ALESSANDRO PROVENZAL. *Riv. ital. gin.*, 1950, 33: 42.

A 60 year old woman was admitted with complaints of leucorrhea and bloody vaginal discharge, malaise, and loss of weight, of 5 months' duration. One tumor 2 cm. in diameter, and another with a diameter of 1 cm. were found in the posterior vaginal wall near the vulva. They were of soft consistency and had short peduncles. Their surface was reddish and covered with a necrotic pseudomembrane.

Histologic study established the diagnosis of cavernous lymphangioma. Certain portions of the formations had the aspect of endothelioma. Undoubtedly, endothelioma is frequently mistaken for sarcoma. As a rule, endothelioma is a benign lesion. JOSEPH K. NARAT, M.D.

MISCELLANEOUS

The Test with Gonadotropins (Preuba de las gonadotrofinas). GUILLERMO DI PAOLA. *Obst. gin. lat amer.*, 1949, 7: 475.

In the test proposed for determining the type of amenorrhea present in certain amenorrheal patients the technique employed is largely that used for therapeutic purposes by Rydberg and Ostergaard (*Acta obst. gyn. scand.*, 1938, 19: 222). Daily intramuscular injections of 3,000 units of serum gonadotropic hormone are administered for 5 doses, and then followed by 3 daily doses of 1,500 units of the urinary gonadotropic hormone. The responsive menstrual bleeding usually occurs from 8 to 12 days later. There have been no seriously disagreeable results with this technique. In 4 instances redness and tenderness developed at the point of injection and disappeared in every instance in a few days. Recently the author has been using a double dosage of the serum hormone (6,000 units) without inconvenience.

Thirty-seven women with amenorrhea (primary in 6 and secondary in 31) were tested with the described technique. In 3 with primary amenorrhea the test was positive and in 3, negative. In 15 of those with secondary amenorrhea the test was positive and in 16, negative.

In 9 of the 15 with positive reaction and secondary amenorrhea the condition had been present for less than 1 year, and in 6, for more than 1 year. The age of 14 of the 18 with positive reaction was less than 30 years. In this group the mild and severe cases, as shown by the Albright test, were equally divided.

In 6 of the 16 patients with secondary amenorrhea the condition had been present for less than 1 year. Of the total 19 cases of this group, 6 were mild and 10 were severe. Among these cases with negative reaction there were intentionally included 3 cases diagnosed as sexual infantilism (probably instances of agenesia ovarica), 1 case of subtotal ovariectomy, and 1 of roentgen castration of 8 years' duration. The latter

served as controls. In 2 of the patients, examination revealed a vaginal reaction (60 to 80 per cent of acidophilic cells) although no menstrual bleeding was noted. These patients are temporarily designated as giving positive vaginal tests which are ascribed either to a deficient ovarian response or to an endometrial insufficiency.

Unfortunately, histologic examination of the endometrium was made in only 3 instances; in 1 of these the progestational stage was present, in another a typical proliferative stage, and in the third a late proliferative stage.

With reference to the application of this test, the author suggests that the Albright (progesterone) test be used, which, if positive, will indicate the presence of a mild amenorrhea. If the test is negative, the Allen (estrogen) test should be resorted to. If this test is negative it will indicate the presence of uterine amenorrhea; if it is positive it will indicate a hypophysiogonadal amenorrhea. In the last eventuality the gonadotropic hormone test will be applied to determine whether the suppression of the sexual cycle originates in the hypophysis (positive) or in the ovaries (negative).

This new test is rational, well founded, and simple of application. It is well adapted to the needs of the general practitioner since it does not require previous training for its interpretation and is carried out with hormone products which are easily procured on the pharmaceutical market. JOHN W. BRENNAN, M.D.

Radical Panhysterectomy, Pelvic Lymph Node Excision, Total Vaginectomy, and Total Cystectomy. One-Stage Operation for Carcinoma of the Female Genitalia Invading the Bladder. Report of 21 Cases. ALEXANDER BRUNSCHWIG, MICHAEL J. JORDAN, and VIRGINIA K. PIERCE. *Am. J. Obst.*, 1950, 59: 237.

The authors report the cases of 21 patients in whom carcinoma of the cervix, vagina, or vulva has recurred or progressed to involve the bladder, and in whom the rectum is not involved. A procedure for excision of the entire vagina, bladder, uterus, and pelvic lymph nodes with bilateral ureteral implantation into the colon was carried out in an attempt to encompass the neoplasm and its extensions, and to spare the pelvic colon.

The immediate surgical mortality was 28.7 per cent (6 deaths) within 28 days of operation. No patient died during operation; one died of hemorrhage and shock 12 hours after operation. The average survival of the 6 patients was 12 days following operation.

Of the 21 patients operated upon, 6 are still alive and free of disease, the remainder having died of cancer recurrence. The operation described by the authors is presented as an alternative surgical attack to complete excision of pelvic viscera upon advanced and uncontrolled cancer of the female genital tract that has invaded the bladder and not involved the rectal colon. These patients were selected not because of a lesion favorable for surgical treatment, but were indeed selected for situations unfavorable for present forms of therapy—radiological or surgical. Radical surgical attack, even with its attendant risks and even without promise of permanent cure, has something definite to offer in patients who present persistent or recurrent cancer of the genital tract. JOHN R. WOLFF, M.D.

Orthostatic Incontinence of Urine in Woman. New Therapeutic Procedure (L'incontinence orthostatique d'urines chez la femme. Un nouveau procédé thérapeutique). P. DELINOTTE and L. ARNAUD. *J. urol. méd.*, Par., 1949, 55: 625.

None of the large number (over 32) of operations for orthostatic incontinence of urine in women possesses the three desirable features, viz., simplicity of technique, lack of danger, and satisfactory results. Plication of the vesical neck is simple, harmless, and not time-consuming, but the results are not reliable. Cervicocystopexy usually furnishes good results but is complicated, and undesirable operative incidents are not infrequent. Aponeurotic suspension of the vesical neck also furnishes good results, but it is more complicated than the two other operations.

The authors simplified the aponeurotic suspension of the neck of the bladder. A strip of skin from a stillborn, preserved in alcohol, is used for the support of the bladder neck. This strip is from 6 to 10 cm. long and from 20 to 25 mm. wide. An incision is made in the anterior vaginal wall, from 1 to 2 cm. behind the external meatus. After isolation of the neck of the bladder, a curved hemostat is introduced on one side of the meatus in such a manner that its tip emerges through a short suprapubic incision where it catches one end of the skin strip. The strip is pulled down, carried around the bladder neck, and pushed upward again on the other side of the meatus. Silk sutures, 15 cm. long and attached to either side of the strip, are tied together in the suprapubic incision. JOSEPH K. NARAT, M.D.

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OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Early Ovarian Pregnancy. NILS SVANBERG. *Acta obst. gyn. scand.*, 1950, 29: 225.

The literature on ovarian pregnancy is briefly reviewed, and the two forms of ovarian pregnancy, i.e., intrafollicular or cortical implantation of the ovum, are discussed. A case of ovarian pregnancy in a very early stage, which was terminated by operation, is reported. The microscopic examination revealed that it was intrafollicular in type. Hemorrhagic chorionic tissue adhering to the fibrous nucleus of a fresh and flattened corpus luteum had grown outward through a rupture in the outer aspect of the ovary and was directly continuous with a plum-sized blood coagulum. The latter was localized outside the uterus and contained the amniotic cavity. Clinically, there was nothing noteworthy in this case.

CHARLES BARON, M.D.

The So-Called Angular Pregnancies (A propos des grossesses dites angulaires). A. GRANJON and A. M. BEAU. *Gyn. obst.*. Par., 1950, 49: 28.

The authors discuss the question as to whether nidation of the ovum at a corner of the fundus can cause a pathologic condition, the so-called angular pregnancy.

Supported by numerous clinical observations and hysterographies, they arrive at the conclusion that nidation at an angle of the uterus does not cause any anomalies in the course of pregnancy, provided that the uterus is normal. Only in the various malformations of the uterus (cordiform, bicornate, unicornous) angular nidation will lead to complications like hemorrhage, abortion, or rupture of the uterus.

It is important to rule out ovarian cysts, fibroids at the uterine angle, and tubal pregnancies which sometimes are mistaken for angular pregnancy.

WERNER M. SOLMITZ, M.D.

Discussion of 150 Cases of Placenta Previa, with Particular Regard to Accelerated Delivery by Means of Vaginal Operation (Considerazioni su 150 casi di placenta previa, con particolare riguardo, tra i metodi operativi vaginali, al parto accelerato). E. LAUDADIO. *Riv. ostet. gin.*, 1948, 3: 385.

The author discusses the vaginal methods for treating placenta previa, despite the theoretical consideration that, on the whole, cesarean section has practically solved the problem of placenta previa. As a fact, however, it can be seen by a perusal of the literature as well as from the author's own material, that the problem is practically far from solved. In the 150 cases reviewed by the author, cesarean section was practicable in only 7 instances.

The material here discussed originates from the work done at the Obstetrical and Gynecological Clinic of the University of Cagliari on the Island of Sardinia, where the people are desperately impoverished, the means of communication are primitive, and the women reluctant to call in a physician for their pregnancies. About a third of the material is of the city itself, the remainder came in from the surrounding country districts. The period covered is that of the 5 years from 1939 to 1944.

Forty-eight of the 143 patients (95.3 per cent) not delivered by cesarean section gave birth to the child spontaneously. This left 95 mothers who underwent some form of vaginal procedure. These procedures included 5 podalic extractions, 6 forceps extractions, 1 podalic extraction of a twin followed by classic version of the second twin, 24 Braxton-Hicks deliveries, 29 classic versions followed by podalic extraction, and 30 accelerated deliveries.

The last method mentioned, which is designated "accelerated birth" by the author, consists of manual dilatation of the cervix or, should there be too much resistance, of unilateral or even bilateral vaginal incision of the cervix, followed immediately by forceps to the head or by podalic extraction, whichever is indicated. The placenta is then removed and any lacerations or incisions are repaired.

One patient with placenta previa lateralis and 11 patients with placenta previa marginalis were treated by podalic extraction or by the application of forceps without the loss of either maternal or fetal life, These were, of course, the less desperate cases. Two patients with placenta previa lateralis, 12 with placenta previa marginalis, and 10 with placenta previa centralis were treated by the method of Braxton and Hicks. Two children were lost, both in patients with placenta previa centralis. Three patients with placenta previa lateralis, 14 with placenta previa marginalis and 12 with placenta previa centralis were treated by classic version followed by podalic extraction. In the lateralis group 1 mother and 1 child were lost, in the marginalis group 2 children were lost, and in the centralis group 2 mothers and 2 children. Finally, 1 patient with placenta previa lateralis, 13 with the marginal type, and 16 with the central type were treated by the method of accelerated delivery with 1 maternal death in the marginalis group and 2 maternal deaths in the centralis group. It will be noted that no child was lost in this group of, as a rule, severe cases.

On the whole, the parity of the mother had some influence on the results here tabulated and the month of pregnancy when the delivery took place had much more—(in the seventh month of pregnancy there were no living children; in the eighth month there were 12 living children; in the ninth month there were 39 living children). Nevertheless, the maternal and fetal mortalities seemed to depend in overwhelming degree on the condition of exsanguination of the mother at the time of admission. The maternal results will probably improve with more universal use

of blood transfusion and adequate anti-infective therapy. For the child, however, the author wishes to emphasize the method of accelerated delivery which is designed to protect both the mother and child from the extra bleeding incident to the protracted measures inherent in the Braxton-Hicks and other vaginal methods discussed.

JOHN W. BRENNAN, M.D.

LABOR AND ITS COMPLICATIONS

Operative Treatment of Dystocia of the Uterine Cervix (Le traitement opératoire de la dystocie du col). PIERRE O. HUBINONT and CHARLES WIRTHEIMER. *Bruxelles méd.*, 1950, 30: 471.

Forty cases of uterine cervical incision, observed in the Gynecological and Obstetrical Clinic of the Saint Pierre hospital in Brussels, Belgium, in the period from 1943 to 1947, form the basis for this report. These cases occurred among about 5,000 deliveries observed during this period. The material is reviewed for the purpose of establishing the time at which a woman in labor with cervical dystocia should no longer be left to the natural forces of labor and the instant at which each step in the operative interference should be initiated.

Nearly all cases of cervical dystocia treated early by rupture of the membranes when the dilatation has attained at least 4 cm. and by the parenteral administration of antispasmodics (papaverine or spasmalgine) will show some improvement and the majority will permit of waiting for spontaneous delivery.

When the obstetrician is faced with a true cervical dystocia which resists medical measures, without fetopelvic disproportion, and when the anatomic conditions for intervention are present (proper dilatation of the lower uterine segment, i.e., sufficient expansion of the vaginocervical line of attachment), the incision of the cervix should be carried out and then the labor left to spontaneous completion or assisted by forceps when the head has reached the floor of the pelvis. Of course, indications on the part of the mother or child may demand immediate application of the forceps or other obstetrical procedure.

The fetal mortality of 12 per cent and the grave, although not fatal, trauma to the 16 women who underwent high forceps deliveries (that is, the forceps were applied before the head had reached the pelvic floor) indicate the desirability of waiting for the spontaneous forces of the mother to accomplish the delivery or to effect a more favorable position of the fetus for the forceps operation.

The high percentage of infections (49) makes some limitation of the total time for the labor seem advisable. Of course, it would be wrong to subject obstetric practice in this matter to a rigid formula; however, the experience of the authors leads them to believe that cervical incision should be instituted after about 20 hours of labor and that the operation should be resorted to within 10 hours after the process of cervical dilatation has come to a standstill.

With these restrictions the operation of radial incision of the medically resistant cervix will be found of advantage to both mother and child. It is relatively free of complications when classically applied and does not offer any disadvantages to subsequent pregnancies. In fact, the authors have already observed 7 instances of subsequent pregnancy in this material, all of which were carried to term and spontaneous birth occurred without incident.

The authors use the sign of Jeannin and Garipuy as a guide for indicating that the labor is sufficiently advanced to render the incision without danger. This sign consists of a "well formed" lower uterine segment which is shown to be present when the coronal suture can be detected within the circle of attachment of the vagina to the cervix. The incisions are made preferably at the terminations of the two oblique diameters. They are 4 in number and should be made under control of the eye. This can be accomplished without the aid of anesthesia and causes no pain.

The authors believe that they have shown that the operative treatment of dystocia of the cervix has a place in the management of this complication.

JOHN W. BRENNAN, M.D.

Rupture of the Symphysis Pubis During Spontaneous Birth (Rotura de la sínfisis púbica en parto espontáneo). EMILIO GIL VERNET and PEREZ SOLER. *Rev. espań. cirug.*, Valencia, 1950, 9: 1.

Two cases of rupture of the symphysis pubis are added to the 117 ruptures occurring during spontaneous delivery already reported. These 117 cases were selected from the 215 ruptures from all causes reported by the authors' superior, Usandizaga, in 1942.

One case was that of a perfectly normal young pregnant woman who went through an apparently normal labor in the authors' own service. The other case was that of a young woman who gave a history, and presented some signs, of sexual infantilism. This woman had begun to menstruate late and thereafter the periods were irregular and scanty. She was delivered by a midwife, who reported that the labor pains were weak and irregular. For this reason the patient was placed in a forced Jonge-Devraigne-Descompte position, with the midwife assisting by bearing down on the thighs while a "brutally forceful" Kristellar expression was carried out. It was during this maneuver that the ripping sound was heard, which apparently indicated the time of the rupture.

The authors' patient was delivered in the same position and also by means of a Kristellar expression; however, in this case the force was applied scientifically and prudently.

Following these deliveries the patients exhibited a roentgenographic and palpatory dehiscence at the pubis of 5 cm. or more. Both mothers thereafter had trouble in walking (waddling gait) and developed incontinence of urine. Support was applied to the pelves and after some weeks the urinary incontinence

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had disappeared in the one case and was greatly diminished in the other. Roentgenographic examination at this time disclosed a considerable approximation of the previously widely separated pubic bones.

The authors believe that it would be unjust to condemn the Jonge-Devraigne-Descompte position and the Kristellar expression maneuver as obstetrical aids. Nevertheless, they believe that these procedures should be used cautiously in the presence of contracted pelves or fetopelvic disproportion, and in hypoplastic women or those of an athletic or intersexual type with tissues deficient in elasticity. Since the authors' patient was treated with just this degree of caution it is thought that there must be some other factor, or factors, favoring this accident. In fact the authors are of the opinion that minor degrees of this accident occur much more frequently than they reach the ear of the scientific reporter. In the practice of midwives, minor degrees of difficulty in walking and of urinary disturbance receive scanty attention.

JOHN W. BRENNAN, M.D.

The Exclusion of Labor Pains by Conduction Anesthesia of the Lumbar Sympathicus (Ueber die Ausschaltung des Wehenschmerzes durch Leitungsanaesthesie des lumbalen Sympathikus). KARL JULIUS ANSELMINO and RUDOLF STEWENS. *Geburtsh. & Frauenh.*, 1950, 10: 198.

The authors noticed that women who, because of dysmenorrhea or vaginismus, were subjected to the operation of Cotte (resection of the presacral nerve) or the operation of Held (resection of the presacral nerve and one or both of the sacral sympathetic trunks), and who later became pregnant, suffered little from labor pain following the former operation and no pain at all following the latter. This observation induced them to begin experimentation on their technique of lumbar sympathetic conduction anesthesia.

An ordinary spinal puncture needle is employed. The needle is inserted while the patient is in the sitting position. The puncture is started at the level of the second lumbar vertebra on a line with the spinous process and 7 cm. from the middle line; the needle is carried in at an angle of about 60 degrees for 7 or 8 cm. to a point just in front of the vertebral body at this level. Here 30 c.c. of a percaine solution from .75 to 1 per cent with the addition of a 5 per cent viscous preparation (Kollidon) are injected.

With this technique blockade of the lumbar sympathicus was carried out during labor in 35 patients. Twenty-seven of these were primiparas and 8 were multiparas. In most of the patients the uterine pains remained, and the abdominal pressure was never disturbed. In 18 of the 35 cases the suppression of pain was so marked that even during the period of expulsion no further anesthesia was necessary; in a few instances, however, a pudendal, or a perineal, local anesthetic was added. In the few instances in which the labor pains became weak they could always be revived by injections of extract from the posterior lobe of the hypophysis. In 9 cases the labor pains ceased for from 5 to 10 minutes immediately following the anesthesia. This period of uterine inertia showed no relationship to the original character of the pains or to the stage of dilatation of the cervix.

In 19 cases there was a lowering of the blood pressure of from 5 to 40 mm. Hg, and this could not always be avoided by prophylactic injections of ephetonin. Otherwise, the mother suffered no inconvenience. Often the relief from the pain was so marked that the mother thought that labor had ceased.

There were 7 instances of asphyxia of the child. These occurrences exhibited no relationship to the maternal blood pressure variations. In 2 of these cases it was necessary to end labor immediately by means of forceps; in the others the labor could be left to the mother's natural forces with injections of cardiazol and ephetonin, the addition of an episiotomy incision, and the Kristeller expression technique. All the children were fresh and vigorous when finally delivered.

From the results of their studies the authors conclude that the labor pains of the initial period are conducted as pain impulses through the hypogastric ganglion, the hypogastric nerves, and the presacral nerve to the cord at the eleventh and twelfth thoracic segments. Apparently a smaller contingent of pain impulses pass directly from the hypogastric ganglion into the sacral trunk of the sympathetic, but these impulses also enter the cord at the eleventh and twelfth thoracic segments.

The birth pains of the later periods of cervical dilatation and of expulsion of the child—especially the distention pains of the pelvic floor—pass through the pudendal nerve and the sacral cord. Such pains can be eliminated either by deep spinal anesthesia (saddle block), by sacral block, by block of the pudendal nerve, or by simple local infiltration of the perineum.

Further work must be done in determining the routes followed by the pain impulses in the labor of childbirth; this objective would seem to be best served by anatomical studies and by a study of the different methods of conduction anesthesia.

JOHN W. BRENNAN, M.D.

NEWBORN

Rh Antibody Stimulation with an Rh Negative Fetus (Rh Anamnestic Reaction) and Its Significance to the Newborn. CHARLES L. SCHNEIDER, DONALD C. BEAVER, L. ANGEL KOZLOW, and WOLF W. ZUELZER. *Am. J. Obst.*, 1950, 59: 543.

The Rh anamnestic reaction, defined as a renewed production of antibody without renewed exposure to the specific antigen, was studied in 3 Rh negative mothers. In each case this reaction occurred in the third pregnancy, and that there had been previous maternal sensitization was substantiated by hospital records of erythroblastosis fetalis in the second born child. Although the fetus in the third pregnancy of each patient was Rh negative, in each case there was

a profound increase in maternal antibodies. In more exact terms, each mother had become previously sensitized to the D factor. High anti-D titers developed in d/d mothers although this time they were carrying d/d fetuses.

Because the course of antibody levels resembles that of incompatible pregnancies, it is concluded that it is not possible to distinguish, by means of the antibody behavior alone, between a benign anamnestic reaction and one which may lead to erythroblastosis. In each of the 3 cases studied, pregnancy had been electively terminated because of concern for the fetus. The 3 babies were without signs of erythroblastosis fetalis, although 1 infant died from respiratory complications incidental to the intervention.

It is concluded that obstetric or pediatric intervention based on maternal Rh antibody production alone is not well advised. Intervention may serve only to expose the mother or child, or both, to such risks as are inherent in the interventions themselves.

GEORGE BLINICK, M.D.

MISCELLANEOUS

Results on Mothers and the Newborn in a Series of 304 Cases of Cesarean Section Treated with Penicillin from 1945 to 1949 (Résultats maternels et infantiles dans une série de 304 cas d'opérations césariennes traitées par pénicillinothérapie, 1945-1949). L. PORTES, M. MAYER, and LEMERRE. *Gyn. obst.*, Par., 1950, 49: 5.

The authors report on a series of 304 cases of cesarean sections in which penicillin was used.

Penicillin was given preoperatively in only 141 of the cases. In this group there was no death from puerperal infection, and only 2 per cent of the patients developed phlebitis during the puerperium. This compares favorably with a group of 111 cases in which no penicillin was given before the intervention; in this group there were 3 fatalities due to puerperal infection.

The authors stress the importance of local penicillin treatment during the section in addition to preoperative and postoperative penicillin therapy. They apply from 500,000 to 1 million units, in accordance with the degree of suspected or manifest infection. Half of this dose is infiltrated in concentrated solution around the sutures, in the parametrium, and in the vesicouterine space. The other half is used in greater dilution to irrigate the peritoneal cavity before the abdominal wall is closed.

When no signs of infection were present, the authors gave 600,000 units daily for 5 days after the operation, and 300,000 units for the following 5 days. In cases of infection the dosage was increased to at least 1 million units daily and the penicillin was given intravenously in saline solution with glucose heparin.

As a result of the penicillin therapy, hysterectomy because of infection was never necessary in this series. In the 304 cases only 8 hysterectomies were done, 6 for fibroids and 2 because of low insertion of the placenta.

The prognosis of cesarean section in placenta previa was also considerably improved by penicillin treatment. Infections were much more frequent in these cases than in sections for contracted pelvis, but all of the 31 patients with placenta previa survived.

In comparing the morbidity and mortality of this series of cases with cases observed in the prepenicillin era in the same hospitals, the authors state that the maternal mortality dropped from 6.43 per cent to 0.7 per cent, the morbidity from 25 to 6 per cent, and the incidence of phlebitis from 6 to 2 per cent.

In contrast to the beneficial effect on the mother, the newborn mortality was not much changed when compared to the prepenicillin era. The over-all mortality was 8 per cent (21 patients). Of these patients, 9 died intrapartum, 7 during the first 2 weeks after section, and 5 in the third or fourth week after section. The longer the interval was between rupture of the membranes and the operation, the higher was the incidence of newborn fatality and of difficult resuscitation. This shows that, in spite of the improved prognosis as to the mother, the test of labor should not be unduly extended.

WERNER M. SOLMITZ, M.D.

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GENITOURINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Physiology of Kidney Innervation in Man (Zur Physiologie der menschlichen Niereninnervation). CHR. VAN GELDEREN. *Helvet. chir. acta.*, 1949, 16: 423.

Very little is known yet about the influence of the nerves supplying the kidney on the renal function in man. Animal experiments have proved that electrical stimulation of the kidney stem causes depression of diuresis whereas enervation is followed by an increase of the blood flow and of diuresis. However, many problems remain unsolved by these experiments. The urea clearance test, the most dependable one for kidney function, was done only rarely, and unilateral enervation which permits comparison of the function of the operative and the nonoperative kidney in the same individual has been done in very few instances in animals.

The author believes that he is the first to have compared the function of both kidneys in patients who had undergone unilateral splanchnicectomy or enervation of the kidney because of essential hypertension or chronic nephritis. He studied the urea clearance, amount of diuresis, sodium chloride concentration, and the *p*H of the urine before and after operation. The urine of each kidney was collected separately by ureteral catheterism.

The results of animal experiments were, on the whole, confirmed by these researches. Splanchnicectomy or denervation of the kidney causes an increase of diuresis and of urea and sodium chloride elimination. No effect could be observed from severing of the parasympathetic fibers of the vagus nerve. No influence of the kidney innervation on the reaction of the urine could be demonstrated. The maximal urea clearance was not changed by the operation. The orthosympathetic kidney innervation acts not merely on the vasomotor nerves (constrictive), especially in respect to the glomeruli, but also on the tubules by furthering reabsorption (secretory).

These results of the author's work are important with regard to the indications for surgery in cases of essential hypertension and chronic nephritis. They show, furthermore, that operation of kidney stones should be combined with denervation of the kidney.

WERNER M. SOLMITZ, M.D.

Renal Injuries. JAMES C. SARGENT and CHARLES R. MARQUARDT. *J. Urol.*, Balt., 1950, 63: 1.

The authors critically examine their experience with renal injuries in well over 200 cases seen over a period of 25 years. They divide the group into three major categories:

1. The most common type of injury is the contusion or minor parenchymal fracture, characterized by more or less pain, a brief spell of gross hematuria and essentially negative x-ray findings. There were 120 such cases. All patients were treated conservatively, recovered completely, and there was no record of any patient suffering late consequences of an injury known to have been of minor degree. They feel definitely that contusions and minor parenchymal fractures always heal spontaneously and without notable consequences to the patient.

2. There were 72 cases of major parenchymal fracture wherein the patients have localized pain and rigidity with gross bleeding lasting from several days to many days, and presenting either pyelographic evidence of parenchymal fracture or soft tissue shadows indicating perirenal hematoma. Only 2 of these patients were subjected to prompt surgery. The other 70 were treated expectantly and among these were 2 with gunshot injury in whom only the bowel perforations were repaired. Sixty-one of these 70 patients recovered nicely from their kidney injuries and 9, treated conservatively, were known to have suffered important sequelae. In 4 cases, perinephric abscess developed and required drainage (with nephrectomy in 1 case). Goldblatt hypertension developed in 1 case and nephrectomy was performed. One traumatic cyst threatened the life of an injured solitary kidney and operation was necessary. One giant renal capsule hydrocele occurred. One patient was found to have, one year later, an atrophic kidney which was functionless. Of these 9 instances of sequelae, 7 patients came to surgery and 2 were advised to undergo nephrectomy but refused. All 9 patients ultimately regained perfect health. With no deaths in the series and with but 9 sequelae, 8 of which were handled effectively at a later date and at a more propitious time, the conclusion of the authors is that seldom indeed is there important need for immediate surgery in renal injuries where major parenchymal fracture has occurred, as long as the general renal architecture is preserved.

The third group presented the shattered kidney, of which there were 14 cases. Six of these were diagnosed at autopsy. Two patients were treated expectantly. One patient with a shrapnel injury had to be nephrectomized a month later, to remove a urinary fistula. The other was nephrectomized 7 days later when well out of shock. Six of the 14 patients were operated upon at once. Four of these were patients who were known to have a kidney shattered beyond hope of saving, and presented signs of progressive bleeding, yet ready for operation before shock had set in. Each of these 4 patients made a nice recovery. The remaining 2 patients had gunshot wounds, and operation was necessary to close bowel perforations. Despite considerable shock, a quick nephrectomy was added. One patient died on the table and the other within hours.

The authors are unwilling to believe that great good is to be gained by exposing and suturing a kid-

ney with a major parenchymal fracture or two. It is essential, however, to distinguish between parenchymal fractures that do well left alone and the shattered kidneys that do not do well. If this distinction can be made by the excretory urogram, that is all that is necessary. If the distinction cannot be made, then retrograde pyelography is obligatory. With the architecture of the renal pelvis reasonably well preserved, even though frank rupture of the parenchyma may be evident, one does not expect serious consequences to ensue, and a masterful restraint on the surgeon's part is quite likely to see the patient and his kidney whole and well again. If, however, the pyelograms show continuity of the pelvic cavity blasted beyond recognition, there can be no hope for the kidney and but little for the patient unless a propitious time for nephrectomy can be found. From their analysis the authors believe that no renal injury can be managed intelligently without certain knowledge as to its type and degree, and that means a clear pyelogram, usually a retrograde pyelogram. They believe that the conservative management of renal injuries should be routine, withholding all surgery unless and until a clear-cut indication for it arises. And finally, they believe renal surgery to be unwise, even when intended to control hemorrhage, if the patient is in profound shock.

ROBERT O. BEADLES, M.D.

Tumors (Not Renal) of the Renal Space (Tumori (non renali) della loggia renale). AUGUSTO BARELLA. *Arch. ital. urol.*, 1949, 23: 277.

Tumors of the renal fascia are often confused with retroperitoneal tumors, especially when they have invaded contiguous organs. Such tumors, classified by the Americans as perirenal, by the French (Albarran, Lecene) as pararenal, and by most other authors as retroperitoneal, are classified by the author as tumors of the renal space (renal loggia). The renal space is formed by the renal or perirenal fascia which originates from the division of the subserous layer. On reaching the outer border of each kidney it divides into two layers, a prerenal (anterior to the kidney) and a retrorenal (posterior to the kidney). The latter is also known as the fascia of Zuckerkandl, and is adherent to the fascia of the quadratus lumborum, psoas muscle, diaphragm, and to the intervertebral bodies. Distally it becomes lost in the iliac fat. The prerenal leaf, which is much thinner than the retrorenal fascia, continues anteriorly to unite with the same structure of the opposite side, then unites with the postrenal fascia and both become well fused with the aponeurotic fascia of the diaphragm. The prerenal and retrorenal fasciae do not fuse distally, a factor which may allow ptosis of the kidney. However, medially the two leaves unite together.

Tumors of the renal space are rather infrequent; they are found more commonly in women between 30 and 60 years of age, and occasionally in children between the ages of 1 and 10 years. They reach an enormous size, from 10 to 20 kgm., and a tumor described by Waldeyer weighed more than 30 kgm. Their shape is oval; they are lobulated at times and pedunculated occasionally; they are also smooth, encapsulated, grayish or yellowish in color, and of a consistency varying from that of a lipoma to that of a bony tumor. They originate in the renal space, and with their progressive growth displace contiguous structures. They may invade the kidney and obliterate the renal vessels to such an extent that nephrectomy may become necessary; they usually displace the ureter and become adherent to the prevertebral vessels. Their growth is slow. At times there is a recurrence of the tumor. When they metastasize they must be considered sarcomatous in nature. They usually invade the liver, lungs, and lymphatic glands, but only rarely the skin, vertebral column, and kidney. Histologically, the tumors encountered more frequently originate from connective tissue and may be benign or malignant. Albarran and Imbert classify them as simple and mixed lipomas, simple and mixed fibromas, sarcomas, and fibromyosarcomas. Etiologically very little is known about them. Because of their frequency in women, Wirchow mentions the mechanical irritation of pregnancy as a possible factor, and because of their occurrence in infancy, other authors advance the theory of embryonal rests with embryonal characteristics.

The first of the author's cases was a fibromyxosarcoma of the renal loggia, so adherent to the surrounding structures that its surgical removal was impossible. The tumor caused attacks of renal colic, altered the function of the kidney, displaced the ureter, and caused the death of the patient. Such tumors are of the more frequent type, but only rarely have they been described as tumors of the renal space.

The second case was a smaller tumor which lowered the kidney function, caused partial occlusion of the renal vessels and slight deviation of the ureter, and necessitated nephrectomy because of its intimate adherence to the kidney. Such tumors are symptomless and their diagnosis is usually made on the operating table. A mass on the lateral side of the abdomen is the first thing noticed by the patient. Compression of the ureter may cause colicky pains; abdominal pains and digestive upsets are rare. Varicocele, edema of the lower extremities, and ascites may occur because of obstruction of the spermatic and other vessels. Inspection reveals an abdominal tumor mass, congested veins, and possibly edema. These findings are confirmed by palpation and percussion. Urinalysis and cystoscopic studies with ureteral catheterization are usually negative. Roentgenological studies by retrograde pyelography with the catheter of Chevassu usually reveal a morphological alteration of the pelvis and calyces of the kidney with deviation of the ureter. Roentgenography of the bowel reveals a change of position from the normal. The differential diagnosis is difficult and must be made from tumors of the liver, ovaries, spleen, pancreas, and mesenteric cysts. The prognosis depends on the type of tumor. The treatment

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is always surgical. The avenue of approach advised by the author is the lumbar route with removal of the twelfth rib if necessary. The surgeon must be very cautious as the tumor may be adherent to the peritoneum, bowel, vena cava, aorta, or ureter, and when removal of the tumor becomes impossible because of these difficulties a nephrectomy must be done. The preoperative study must include the anatomical and functional status of the opposite kidney. JOSEPH M. A. PAPE, M.D.

A Fatal Accident of Intravenous Urography (Un incidente mortale da urografia endovenosa). ROMEO POZZATO. *Arch. ital. urol.*, 1949, 23: 353.

A 55 year old woman had several years previously undergone a cholecystographic examination for gall stones. The preparation used is assumed to have been tetraiodophenolphthalein; this examination was allegedly accomplished without incident. The examination which resulted in the death of the patient was undertaken for symptoms suggestive of kidney stone and consisted of a descending pyelography with the intravenous administration of neopielofanina (aqueous 75 per cent solution of the disodium salt of 3.5 methylchelidamic acid). The injection was given slowly (5 minutes) by a technical expert, and seemed to be entirely successful; however, 3 minutes after the injection was finished the patient suddenly cried out, "Oh, my head," and became unconscious. Consciousness was not regained, the patient dying 6 days later with symptoms referable to the lungs and brain.

Autopsy disclosed widespread congestion and ecchymoses (subendocardial and subpleural), a septic spleen, and congestion and turbid degenerative foci of the liver and kidneys. There was a notable congestion of the leptomeninges with an abundant subarachnoid, partly coagulated hemorrhage and some extravasation of blood into the cerebral ventricles. The thyroid was also somewhat congested, but otherwise not notably changed. The lungs suggested bronchopneumonia, especially in the lower portions.

The author believes that meningeal involvement, of which the patient evidently died, is not incompatible with the postulation of anaphylactic shock in this case. Of course, he doubts that the sensitization concerned the metallic iodine alone and believes that it was associated with some constituent of the organic compounds used in these tests. The constituent was perhaps the same in both compounds and perhaps freed from the combination upon contact with the living tissues. This constituent in the first examination then acted as an allergen and produced the sensitized state which resulted in the anaphylactic manifestations following the second injection some years later.

Since it would be very simple to inject a tiny amount of these preparations as a test for sensitization preceding the test injection, the author believes that the failure of the urologist to do this routinely is a mark of carelessness and is perhaps legally culpable. JOHN W. BRENNAN, M.D.

GENITAL ORGANS

The Pathogenesis of Acute Urinary Retention in Prostatic Hypertrophy. I. The Prostatic Content of Histamine and of the Ferments Correlated with Histamine (Sulla patogenesi della ritenzione acuta d'urina da ipertrofia prostatica: I. Il contenuto della prostata in istamina e nei fermenti correlati con l'istamina). G. PEZZUOLI and W. MONTORSI. *Arch. ital. urol.*, 1949, 23: 389.

Nine prostate glands, freshly removed or preserved in acetone, were ground up, extracted with Ringer's solution, and dialized by means of a cellophane filter, and the histamine content was determined through its power to produce contraction in strips of gut by the usual technique. The concentration of histamine was measured against standard solutions of this substance.

By this means it was found that the amount of histamine per gram of prostatic adenoma tissue varied a great deal, but was greatest in cases in which the patient was suffering from acute retention, that is, in whom the prostate was in a congested state. In 1 specimen, in which the middle and both lateral lobes were examined separately, there was more than twice as much histamine in the middle lobe.

These results were checked against guinea pig injections, and it was found that the extracts coincided in results with intravenous solutions of standard concentration of this substance. Also, the results were checked against the findings of the same nature in the normal prostate of dogs; here it was found that the average concentration of histamine in the normal prostate of the dog and in the adenomatous prostatic tissue in the human being was about the same, but that the concentration in the normal prostate gland was much more constant. In general, the highest concentrations found in this material were significantly higher than those reported for other tissues such as intestinal mucosa, skin, lungs, and liver.

In all of these experiments the effects of the presence of histamine could be checked by antihistaminics (Thephorin), and suggested that considerable amounts of histaminase were present. Results, however, were meager when efforts were made to determine the presence and amounts of the precursor of histamine (histadin-carboxylase) present in prostatic or prostatic adenoma tissue.

With these studies the authors believe that they have more or less substantiated the possibility of the participation of an allergic factor in the etiology of the acute recurrent attacks of urinary retention in these cases of prostatic adenoma, attacks which are not easily explained to full satisfaction on the basis of mechanical factors exclusively.

It is suggested that histologic studies of the prostatic tissues removed at operation during the early acute phase of the attack of urinary retention might do much to clear up the question of their participation in the development of this condition.

JOHN W. BRENNAN, M.D.

Stages in the Development of the Operative Treatment of Prostatic Obstruction. H. Simpson Newland. *Med. J. Australia*, 1950, 1: 285.

In this very interesting article the author traces the development of prostatic surgery from the time of the lithotomists to the present. The perineal route for the removal of bladder stones was used with various modifications by Celsus, Pierre Franco, Germain Colet, Frere Jacques, and Cheselden. John Douglas, in 1723, advocated the suprapubic route, and with the advent of anesthesia and antisepsis its advocates became more numerous. In 1827, Amussat removed a portion of the prostate in the course of a lithotomy. In 1885, Dittel suggested the purposeful removal of the obstructing prostate.

In the development of the suprapubic prostatectomy the names of McGill, Belfield, Fuller, and Freyer stand out in early work. More recently Harris and Hey made significant contributions. In the past 5 years Millin has added the retropubic approach to the prostate to the armamentarium of the urologist.

The perineal prostatectomy was developed by Hugh Young at the turn of the century. Winsbury White modified Young's procedure by suggesting reconstruction of the urethra.

In the twentieth century the interest in perurethral resection has gradually mounted. The names of Young, McCarthy, Thompson, and many others have been prominent in the development of this route. John T. Grayhack, M.D.

The Retropubic Approach to Vesical Neck Pathology in Children. Robert Lich, Jr., Joseph E. Maurer, and Stephen Burdon. *Brit. J. Urol.*, 1950, 22: 21.

The authors state that they have had disappointing results in posterior urethral and vesical neck disease in children when using currently advocated therapeutic methods—the transurethral approach is either unsatisfactory or impossible in very young children and the suprapubic method lacks visualization. The retropubic technique of Terence Millin was then used.

In older children a transverse suprapubic incision is made but in infants a longitudinal type is used. In children the puboprostatic ligament is seen as a band of tissue originating from the pubis, which is closely applied to the anterior part of the prostate gland and fuses with the bladder neck. It must be severed for adequate visualization, and always contains a small blood vessel.

A midline incision is made in the upper two-thirds of the prostate, extending into the prostatic urethra, over an indwelling catheter. Hemostatic sutures are left long for tractors. The entire length of the posterior urethra is easily demonstrated. The incision may be extended into the bladder for a very short distance, if necessary.

Sclerosis or hypertrophy of the bladder neck may be excised completely. The authors suggest palpation of the area, as on 2 occasions potentially obstructing tissue was more easily palpable than visible. The incision is closed with a continuous catgut suture over a retention catheter. The bladder irrigating fluid should be clear. The abdomen is closed with drains in the usual manner. The urethral catheter is removed after the fourth postoperative day.

The results have been excellent in this group of children and the convalescence has been brief and comfortable.

The cases of 4 patients ranging from 3 months to 8 years of age, are discussed to illustrate the preoperative and postoperative courses.

Nathan Rosenbloom, M.D.

Bladder Neck Contracture Following Retropubic Prostatectomy Treated by Transurethral Resection. J. Bitschai and G. Axler. *Brit. J. Urol.*, 1950, 22: 63.

The authors caution against postoperative contracture of the bladder neck. They note that despite techniques such as the Thomson-Walker posterior V-flap excision, Albarran's incision of the posterior bladder neck lip, and Harris' posterior stitch technique, contracture may still occur. They suggest the excision of a wedge from the posterior lip, fixation of this structure to the floor of the prostate bed, or both. An illustrative case of failure despite the aforementioned precautions is cited.

A case of retropubic prostatectomy with a 125 gram prostate containing numerous microabcesses is described; a posterior neck wedge was made in this instance. Three and one-half months after operation there was complete urinary retention. Four "cuts" with a knife electrode were made in a flap of scar tissue at the bladder neck. These were inadequate and 1.5 gm. of tissue were resected from the neck. Good results were obtained.

The authors believe that the overgrowth of fibrous tissue was due to persistence of infection in the prostatic bed. Nathan Rosenbloom, M.D.

Contribution to the Classification, Histogenesis, and Pathology of Malignant Tumors of the Testicle (Contribucion a la clasificación, histogénesis y patología de los tumores malignos de testículo). Benjamin R. Schlossberg. *Arch. Soc. argent. anat.*, 1948, 10: 144.

It is believed that the present classification of testicular tumors does not reflect their true characteristics either histologically or histogenetically. For this reason Schlossberg, on analyzing 100 tumors of the testes, proposed a change in nomenclature. The term "gonadocytoma" designates a tumor different from seminoma and expresses that its origin is from sexual cells. It may be compared to an ovarian tumor which derived from the histologic structure of the ovary and is known as dysgerminoma.

Gonadocytomas are further separated into two types. The first type includes those which are derived from Sertoli's cells, and the second type in-

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cludes those which arise from spermatogenetic cells. They are only slightly differentiated from the cells of the tubules. A third type may be observed, in which both of these elements are present, and hence it is designated as a "mixed" variety. Under the teratomas the following classes are recognized: teratocarcinomas, teratoepitheliomas, and teratosarcomas.

The hypothesis is advanced that trauma or necrosis of the testicular parenchyma liberates certain substances which induce or cause the teratoma. It is thought that in teratogonadocytoma, the teratoma and the gonadocytoma elements arise from a common origin simultaneously. The author includes the teratoepitheliomas under the term "embryonal carcinoma." STEPHEN A. ZIEMAN, M.D.

MISCELLANEOUS

Reflex Anuria. W. F. SUERMONDT. *Arch. chir. Neerl.*, 1949, 1: 269.

As a prelude to discussion of reflex anuria, the author considers the current concept of renal physiology. Glomerular filtration activity, tubular reabsorption and excretion, and the factors influencing filtration pressure, which are basically responsible for the passage of fluid into the capsule of Bowman, are reviewed.

The different factors concerned in the reduction of urine are classified.

1. The extrarenal factors include shock, which, by lowering of the filtration pressure, markedly impairs glomerular filtration, and dehydration as seen in vomiting or diarrhea and sweating.

2. Renal factors include any condition causing destruction or degeneration of the kidney parenchyma, which, by damage to the glomerular capillaries, results in diminution of the filtrating surface, and by injury to the tubular elements results in an increased rate of passive reabsorption. Included here are the common surgical and medical conditions such as hydronephrosis, pyonephrosis, tuberculosis, glomerulonephritis, and the disturbances causing lower nephron nephrosis.

3. The postrenal factors impede the flow of urine from the kidney to the exterior. Such factors are found in the rare bilateral blockage of the ureters by calculi, in compression of the ureters by enlarging carcinomas, and in unilateral calculus obstruction in a solitary kidney.

4. In the prerenal form of oliguria or anuria, in which classification reflex anuria belongs, there is a limitation of blood flow through the glomeruli.

Reflex anuria develops in a healthy kidney upon which no postrenal factors act and in which no renal factors exist, the resulting reduction in urine volume being solely due to the effects of stimulation of the renal sympathetic nerve supply. This innervation originates in the sixth thoracic to the third lumbar segment of the sympathetic chain and travels along the splanchnic nerve and rami communicantes of the lower thoracic and first and second lumbar ganglia, to unite with branches of the semilunar ganglion. The fibers pass to the pelvis and renal blood vessels reaching and spreading over the capsule. Stimulation of the sympathetic plexus effects an angiospasm which, as shown by Trueta, diverts the greater part of the blood stream from the cortex to the medullary area. This deficiency of blood volume in the cortex lowers the filtration pressure in the glomeruli. At the same time, sympathetic activity also stimulates the antidiuretic hormonal outflow from the posterior pituitary lobe which increases the reabsorption of water by action on the distal tubules.

Angiospasms which cause reflex anuria may arise in the healthy kidney following an acute condition in the other kidney (renorenal reflex). Usually, however, it develops as a result of the blocking of the ureter of the other kidney by a stone, kinking, or a ligature following operation. Anuria occurs only when there is a sudden and complete blockage in consequence of hypersensitivity of the sympathetic nervous system. The type of blockage which is incomplete and becomes obstructive slowly, produces hydronephrosis, not anuria. A rarer group of reflex anurias follow catheterization of the ureter, pyelography, or too rapid emptying of a distended bladder, which stimulates the sympathetics by sudden pressure changes.

Reflex anuria demands immediate treatment. In those cases not caused by stone blockage, treatment is directed toward interrupting the reflex cycle and combating the uremia. One should begin with splanchnic block, intravenous administration of concentrated glucose solution, and, if acidosis is present, the use of sodium bicarbonate. When this is unsuccessful, decapsulation and even peritoneal lavage should be considered. The diet should be restricted in fluids and in protein, but should be rich in carbohydrate. Small transfusions of plasma may initiate diuresis. Since there is no urine in the kidney pelvis, ureteral catheterizations are futile. When the anuria is due to sudden blockage by stone on one side, treatment is aimed at speedy removal of the obstruction, as the cause of the abnormal sympathetic stimulation affects both sides. In addition to ureteric catheterization, it is advantageous to perform a splanchnic block to break the sympathetic arc. Should catheterization fail, ureterolithotomy is urgent. Pending re-establishment of diuresis in 1 or 2 days, the intravenous infusion of 25 per cent glucose and plasma, a butter and sugar diet, and building up of the alkali reserve are in order.

Five cases are presented which demonstrate the author's experience with reflex anuria.

ALLAN K. SWERSIE, M.D.

Late Renal Changes in Paraplegia: Destructive Lesions. HERBERT S. TALBOT and MELVIN K. LYONS. *J. Urol.*, Balt., 1950, 63: 667.

After a previous study of 331 paraplegic patients who were observed for 2 years (1946 to 1948) and study of the current series of 182 additional patients who were followed up from August 1, 1948 to April

15, 1949, these authors have been impressed by the significant late morbidity and mortality from destructive renal lesions.

Thirteen patients, 7.2 per cent, of the second series had severe renal damage. All 13 were infected. Nine of these had calculi, while 3 others had massive hydronephrosis.

The most important safeguards seemed to be adequate vesical function and early return to physical activity. Warning is given that surgical procedures must conserve kidney tissue and must not be radical.

ORMOND S. CULP, M.D.

Cystourethrography: Its Role in the Diagnosis of the Neurogenic Bladder. CHARLES NEY and JOHN DUFF. *J. Urol.*, Balt., 1950, 63: 640.

Cystourethrograms on patients with neurogenic bladders revealed the following 11 abnormalities: funnel urethra, pine-tree-shaped bladder, vesicoureteral reflux, hourglass bladder, saccular dilatation of the posterior urethra, pseudosphincter formation, spastic external sphincter, relaxed external sphincter, contracted hypertonic bladder, large hypotonic bladder, and calculi.

Examples of each type are given as well as a comprehensive review of the controversial literature on each subject. The authors point out that none of these abnormalities is diagnostic of neurologic disease or injury per se, but they suggest that any such findings warrant very careful neurologic evaluation of the patient. ORMOND S. CULP, M.D.

The Role of Nerve Blocks in the Management of Traumatic Cord Bladders: Spinal Anesthesia, Subarachnoid Alcohol Injections, Pudendal Nerve Anesthesia, and Vesical Neck Anesthesia. ERNEST BORS, A. ESTIN COMARR, and STANLEY H. MOULTON. *J. Urol.*, Balt., 1950, 63: 654.

After complete urologic surveys, including cystoscopy, cystometry, cystography, and sphincterometry, various types of anesthesia were used in an attempt to distinguish between functional and structural contractures of the bladder neck. These procedures included 56 pudendal nerve blocks, 25 vesical neck infiltrations, 28 spinal anesthesias, and 35 subarachnoid alcohol injections.

This report includes the authors' indications, contraindications, anesthetic techniques, and management of patients after the various procedures.

Results proved to be either temporary or permanent improvement in the original status of the cord bladders. The effect of spinal anesthesia was used as a criterion for subarachnoid alcohol blocks and proved to be an accurate prognostic test in 66.6 per cent of the cases tested.

Of 116 patients who were subjected to one or more of the procedures, 48.6 per cent developed good permanent results.

A comprehensive review of the literature is included and the authors discuss the physiologic significance of many of their clinical observations.

ORMOND S. CULP, M.D.

Neuroblastoma Involving the Urinary Tract. FRANCIS G. HARRISON, HERBERT L. WARRES, and JOHN A. FUST. *J. Urol.*, Balt., 1950, 63: 598.

Neuroblastomas are tumors consisting of immature undifferentiated neuroblasts. They are characterized by lack of uniformity, by cells with scanty cytoplasm, and nuclei with dense chromatin. Pseudorosettes are often formed. Fibrous septa dividing the tumor into compartments are characteristic. Neuroblastomas originate frequently in the adrenal medulla and the sympathetic ganglia of the abdomen. The proximity of these structures to the genitourinary tract results in frequent involvement of this system.

Many clinical facts about neuroblastomas are known. They are primarily tumors of infancy and childhood, although they have been reported in elderly patients. The symptoms are due to involvement either of adjacent structures by local extension or of distant structures by metastases. The bones, liver, lungs, and lymph nodes are the sites frequently involved in metastatic growth. The bone lesions are usually destructive and are often bilaterally symmetrical. Roentgenographic studies often show the results of pressure on, or destruction of, the kidney, ureter, or bladder when the genitourinary system is involved. Calcification in the region of the new growth is frequent.

Treatment of neuroblastomas is either surgical or by irradiation, according to the extent and location of the lesion. Radiation therapy is best given in small divided doses. It is said that irradiation is successful even if local metastases have occurred. Farber states that a neuroblastoma may undergo spontaneous necrosis and disappear, and that it may also undergo spontaneous maturation and become a benign ganglioneuroma.

The authors report 8 cases of neuroblastoma. Four were seen in children, 2 in adolescents, and 2 in adults. The right ureter was involved in 1 case, the left ureter in 2 cases, the left kidney in 4 cases, and the right kidney in 2 cases. Three of the patients had combined surgery and radiation treatment, 2 had radiation alone, and 1 had surgery only. Five of the patients died within 6 months after admission to the hospital. One patient died 5.5 years after surgery and radiation therapy, and 2 patients are still living 22 months and 9 months, respectively, after similar treatment. The authors think that early surgery followed by radiation is the treatment of choice. JOHN T. GRAYHACK, M.D.

Osteitis Pubis. With 5 Case Reports. D. ST. CLAIR L. HENDERSON. *Brit. J. Urol.*, 1950, 22: 30.

The author lists 64 cases of osteitis pubis and reports 5 cases; 4 of the latter followed retropubic prostatectomy and 1 followed suprapubic prostatectomy.

The symptoms of this disease consist primarily of pain over the pubis with motion; the pain may radiate to the legs. Urinary symptoms may be dysuria or bladder spasms, or they may be absent.

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The signs are those of tenderness on pressure over the symphysis and pubic bodies. Local inflammation is not usually present. Hyperesthesia is present frequently in the cutaneous distribution of the obturator nerve in the inner side of the thigh. Later, adductor muscle group atrophy in the legs may occur.

The roentgenogram shows either uniform or patchy decalcification of the bodies of the pubes. This may continue to a U-shaped defect at the pubic symphysis. Later, there is recalcification of the area.

Leucocytosis is seldom present and the blood picture is usually normal. Biopsy shows chronic inflammatory tissue or chronic osteomyelitis.

Diagnosis is made from the history and by x-ray examination. The disease is usually self-limiting, lasting from 3 to 6 months and usually clearing without residual symptoms.

The treatment is largely symptomatic. Local heat is used for relief. Penicillin and sulfonamides are of little value, and no massage or manipulation is indicated. Surgery is used only in the presence of abscess or sequestrum formation.

Theories as to the cause of osteitis pubis are:

1. It occurs only in patients whose bladders have been opened with injury to the periosteum due to traction, drainage tubes, or the spillage of urine at surgery.
2. It is due to periosteal injury by the needle in retropubic prostatectomy.
3. It is caused by acute bone atrophy.
4. It may be brought on by retropubic infection.
5. It may be due to low grade pelvic cellulitis with lymphatic spread.

The author, in discussing these theories, reaches the following conclusions:

1. A prevesical infection may be responsible in some cases arising soon after surgery.
2. Prostatic infection appears to have been the primary lesion in many of the recorded cases, and it seems likely that the infection may have spread from the prostate.
3. The rarity of this condition, as well as of perivesical suppuration in the female, in spite of the frequency of pelvic cellulitis, is simply explained. The primary focus in many of these cases is in the cervix or uterus. The lymphatic drainage is to the broad ligament. The prevesical space may be involved if the anterior abdominal wall is injured in childbirth, or if in the presence of chronic pelvic inflammation the alternate lymphatic drainage route is utilized.

NATHAN ROSENBLOOM, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

The Pathogenesis of Localized Bone Necroses (Die Entstehung der lokalen Knochennekrosen). MENNO MENNENGA. *Chirurg*, 1950, 21: 71.

The group of localized bone necroses discussed in this article includes Perthes', Koehler's, and Kienboeck's lesions, and similar conditions involving the sesamoid bones or circumscribed portions of the spongiosa in other bones. Except for necrosis of the lunate bone, all of these occur in adolescents.

In spite of numerous studies the pathogenesis of aseptic necrosis has not been explained satisfactorily. The author presents the hypothesis that it is caused by disturbances of the capillary blood supply from the medullary space. These disturbances may be caused by different factors among which allergic processes in the bone marrow may play an important role. As bone tissue is particularly sensitive to circulatory disturbances, interruptions even of short duration are sufficient to cause localized necrosis. Histologic and roentgenologic studies show that the necroses are always situated in areas supplied from the marrow, never from the periosteum.

According to this hypothesis, the conditions are not primarily disturbances in the bone but in the bone marrow, leading to impairment of the circulation in the bone and thus causing necrosis.

To prove his point the author injected saline solution, serum, and whole blood into the medullary cavity of the femur in rats and rabbits. He succeeded in producing aseptic inflammation of the medullary space which led to widespread necrosis of the bone. WERNER M. SOLMITZ, M.D.

Avascular Necrosis of Bone in Children. CHARLES N. PEASE. *Med. Clin. N. America*, 1950, 34: 165.

The term "avascular necrosis" is suggested. In this condition a complex pathological pattern is presented, with osteoid tissue in varying degrees of calcification, and new bone formation, described by Phemister as "creeping substitution." In some cases a low grade fever and an increase in sedimentation rate makes an infectious origin probable. Two interesting cases of LeggPerthes disease affecting two brothers, and a father and son may be due to a focal infection with an allergic specificity to the organism, in which there is inherent susceptibility of the tissues of the right affected hip in the father and son. Some cases progress without any symptoms until discovery, later; sometimes there are referred pains (in the knees) only.

Avascular necrosis is a self-limited disease with the final result exhibiting an overgrowth of the involved bone. In some cases the author performed an extraperitoneal obturator neurectomy, expecting a more rounded femoral head.

Involvement of one vertebra (Calve's disease) occurs between the ages of 5 and 11 years, while the kyphosis dorsalis juvenilis (Scheuerman) occurs most commonly between the ages of 10 and 18 years. In the spine, particularly, the process of avascular necrosis can be present without any subjective complaint.

As to weight-bearing in the destructive and healing phase of Legg-Perthes disease, the author allows activity as soon as symptoms subside, and bedrest or crutches are allowed during the pain period only; otherwise demineralization, atrophy, diminished vital capacity, and physiological changes may occur. Too often, the x-ray film, and not the child, is treated, and it is believed that complete restriction of weight-bearing has no influence on the final outcome of the disease (confirmed by observations of Legg and Waldenström).

Avascular necrosis of the tibial tubercle is encountered in boys between the ages of 10 and 18 years. The avascular necrosis of the tarsal scaphoid (Koehler's disease) appears between the ages of 3 and 8 years and requires no treatment.

In apophysitis of the heel, elevation of the heel is sufficient to relieve the pull of the Achilles tendon.

The avascular necrosis of the second metatarsal head (Freiberg's disease) is four times more frequent in girls and is usually seen after the age of 10 years. Metatarsal bars will give relief.

ERNEST H. BETTMANN, M.D.

Giant Cell Bone Tumors (Sui tumori a cellule giganti delle ossa). PIETRO MAGGIO. *Gior. ital. chir.*, 1949, 5: 620.

Robin, in 1850, classified certain bony tumors with multinucleated giant cells as "benign sarcomas," a term which Bloodgood later changed to "giant cell tumors." This term is generally accepted now. Such tumors are found in the mandible where they are known as epulis; when they occur in the long bones they are usually found at the epiphyses. They may originate from the periosteum or from the marrow, and may cause spontaneous fractures and separation of the epiphyses, but only occasionally do they cause ulceration. Such tumors may grow to a considerable size without causing much discomfort to the patient, and Nélaton relates the case of a pianist afflicted with such a tumor at the wrist but who played the piano with great agility of the fingers. When these tumors are present in the legs they may cause much pain. Fracture of the involved bone usually discloses the pathology. The lymphatic glands become involved only in the presence of secondary infection. The roentgenologic study of such tumors reveals spheroidal masses resembling single or multiple soap bubbles without a distinct line of demarcation between the cortex and periosteum. Such tumors must be differentiated from

bone cysts, which do not occur at the epiphyses but cause an oblong enlargement of the bone and reveal a cavity of uniform transparency, and present a capsule which is formed by the thinned cortex. There is a sharp demarcation between the bone and the tumors. When the clinical and roentgenological studies are not sufficient to make a definite diagnosis, the author advises an exploratory osteotomy with biopsy.

The histological structure of the tumor is still a debated question; some authors believe the tumor is of an inflammatory nature; others believe it is of neoplastic origin, and still others place it between an inflammatory tumor and a blastoma. Koenig and Ritter, among others, in describing tumors of the maxilla state that the inflammatory reaction is caused by carious teeth. Delater explains epulis as originating from an epithelial granuloma with proliferation of the various connective tissue elements and with it the formation of giant cells. Meyerding explains it as a reparative process of the bone tissue either because of trauma or inflammation. Virchow, who was the first to point out the neoplastic nature of the tumor, defined it as an encapsulated myelogenous sarcoma, while Nélaton described it as a benign myeloplax.

The author reports the cases of 3 tumors related to the teeth, 1 tumor related to the lower extremity, and 1 to the lateral malleolus, gives a detailed microscopic study, and draws his own conclusions.

The author states that in the epulis as well as in the bones the microscopical picture of the tumor is represented by fusiform or ovoidal, and bipolar or multipolar cells endowed with three or four protoplasmic processes with an oblong nucleus and a moderate amount of chromatin. Interspersed among these cells are giant cellular elements, irregular in shape and also endowed with processes along their peripheries and with a number of nuclei in their centers. The ovoidal and fusiform elements and the giant cells are united together with fibrillar fasciculi so as to give a syncytial pattern. Here and there are to be noted fissures covered with endothelium which explain the presence of interstitial hemorrhages, hematic pigment, and brownish discoloration of the tumor. There are to be observed also osseous trabeculae, more or less calcified, but some trabeculae lack this calcareous infiltration. The involucrum consists of a fibrous capsule from which fibrous fasciculi take origin and proceed toward the center. Such a capsule signifies the benignity of such tumors.

The cellular characteristics of such tumors and the appearance of the blood vessels as embryonic fissures simulate mesenchymal tissue. This led Von Hueck and Mockenberg to describe them as vascular sponges. Also the embryonic character of the matrix, i.e., the specific proliferative activity and invasion of the metaphyses and epiphyses, brings such tumors closer to hamartomas.

In 1 of the author's cases the cellular elements presented a rather anaplastic character, as the fusiform, ovoidal, and giant cells had a tumultuous and disordered proliferative tendency to invade and destroy normal bone before the periosteum had a chance to react and produce new bone. This same proliferative activity explains the tendency of the neoplastic elements to invade the lumen of the blood vessels and be carried far away to cause metastasis. Such tumors are then to be considered true sarcomas. The author agrees with Stewart, who classifies such tumors as benign and malignant giant cell tumors. The important characteristics of the malignant type concern the morphology of the giant cells (there is a difference in size and shape of the cells and the nuclei are not centered regularly) as well as the different phases of kariokinesis.

The conservative treatment is surgical removal with cauterization of the bed. Histological examination must always accompany the surgery. In doubtful cases and in cases with metastases the surgery must be radical, namely, removal of the bone involved and autogenous transplantation, or amputation.

The author does not agree with Lacharite and Holfelder who suggest x-ray or radium irradiation as treatment and prophylaxis before surgery.

JOSEPH M. A. PAPE, M.D.

Exostotic Form of Osteoid Osteoma. A Special Form of Osteoid Osteoma with Point of Departure from the Bone Cortex with Paraosseous Development (Sur une forme spéciale d'ostéome-ostéoïde à point de départ cortical et á évolution para-osseuse. L'ostéome-ostéoïde a forme exostosante.) L. TAVERNIER, M. GUILLEMINET, and R. FAYSSE. *Lyon chir.*, 1950, 45: 133.

Four examples of a type of bone tumor which has not been previously described are reported. All 4 neoplasms occurred in young individuals, 12, 14, 35, and 20 years of age, respectively. All took origin from the cortical layers of the bone, 3 from that of the upper portion of the femur, and 1 from the upper portion of the humerus.

The first symptom in each case was pain which grew progressively worse until it was present day and night. After a period of from 3 weeks to 2 months a tumor was palpable; it was deeply seated and painful to pressure. In no case was there a previous history of infection or trauma. When sufficiently grown the mass caused an elevation of the local tissue surface, a local warmth of the tissues, and some dilatation of the venous blood vessels over it. In 3 of the patients there was some elevation of body temperature, from 37.8° to 38°C.

One of the patients underwent an amputation under the impression that the tumor was a sarcoma; this happened 20 or more years ago. The patient has since remained well. In another patient the tumor was removed together with the cortex of the femur as far as healthy bone. The specimen was diagnosed as fibrous osteitis. This patient was lost from view after 4 months. The next patient in order of time had humeral involvement. The tumor

was removed down to the healthy cortex and the patient given moderate doses of roentgen irradiation. After 2 years there was no sign of recurrence and the humerus had regained a totally normal appearance. The remaining case was seen by the authors only recently. Persuaded by this time of the benignity of such lesions it was decided to remove merely a biopsy specimen, close the wound, and subject the patient subsequently to small doses of irradiation therapy. The factors of the treatment given were 180 kv., and 0.5 copper through a single field, and 1,550 roentgens were given in 7 sessions. Four months later the tumor had not grown any larger and showed generalized signs of eburnative calcification. This specimen was also diagnosed histologically as fibrous osteitis.

The authors believe that this type of tumor is benign, and he assigns the whole group to the tumor type described by Jaffe as osteoid osteoma.

The treatment should, therefore, be conservative, consisting of a simple biopsy followed by complete exeresis of the tumor itself in so far as this can be realized without excessive difficulty. It would seem worth while to complete partial exereses with feeble dosages of irradiation therapy.

JOHN W. BRENNAN, M.D.

Congenital Torticollis. K. F. HULBERT. *J. Bone Surg.*, 1950, 32-B: 50.

An historical review and theories of the origin of congenital torticollis are presented. The records of 100 patients with the condition who were seen between 1938 and 1945 at the Hospital for Sick Children, London, had been studied. Congenital skeletal abnormalities were excluded.

Sixty-seven of the patients comprised a group with torticollis that was noticed at or soon after birth. They were brought to the hospital between the ages of 3 weeks and 3 months. In no case was operation needed. The torticollis in this group was considered postural and temporary. No sternomastoid tumors were noted.

The accepted clinical picture of congenital torticollis is as follows:

At about 10 days after birth a tumor is discovered in the substance of the sternomastoid which may or may not be associated with transient spasmodic torticollis lasting a few days or weeks. Both heads of the muscle are usually involved. The tumor persists for 2 or 3 months and then disappears gradually in 4 to 6 months. The development of torticollis is delayed until the age of 3 or 4 years when the short neck of the infant lengthens into that of the young child. As growth proceeds, the torticollis leads to facial asymmetry. The mastoid process on the affected side becomes elongated, and ossification may occur in the clavicular origin of the muscle.

In this second group with late onset of torticollis, there was often an associated history of sternomastoid tumor. The patients' average age was 4 years when they were first seen at the hospital. Twenty of the 33 patients required surgical intervention.

Most patients with sternomastoid tumor, and all with postural torticollis were treated successfully by early manipulation by the physical therapist and the mother. Two fundamental manipulations are necessary. The first is bending of the neck away from the affected side with the chin rotated toward it. The second, not so commonly employed, is that of flexion of the neck.

The discussion of the surgical treatment is presented. The author prefers subcutaneous tenotomy of the sternal and clavicular heads. Should more correction be desirable, open tenotomy is preferred at the level of the hairline in the mastoid area. Postoperatively, various methods are used to immobilize the head in overcorrection. Physical therapy is an integral part of the treatment.

Treatment should be continued for at least 6 months and every patient should be kept under observation for several years.

KENATH H. SPONSEL, M.D.

Vertebra Plana. Its Later Development. Its Localization in Several Vertebrae (La vertebra plana, son évolution lointaine. Localisation sur plusieurs vertèbres). E. ALLENBACH, E. WIEST, and H. MAURE. *Rev. orthop.*, Par., 1949, 35: 435.

Vertebra plana osteonecrotica Calvé or juvenile osteochondritis of the vertebra is a rare condition of unknown etiology which was described first by Calvé in 1925. It has been observed in children only. The symptoms simulate Pott's disease; however, the roentgenogram reveals a flattened, very opaque vertebra which is wider in its transverse diameter than the neighboring vertebrae. The condition persists for a number of years and heals gradually under appropriate treatment. Little is known about the pathologic anatomy; only 1 case is on record in the international literature and that came to autopsy. The patient who died of an intercurrent disease showed aseptic necrosis of the body of the vertebra.

The authors report 2 typical cases. One of these started when the patient was 3 years of age and was followed up for 16 years. The other case, that of a 7 year old child, was unusual because several vertebrae (D6, D7, and D9) were affected. Treatment consisted of immobilization in a cast for 1.5 years and later on in a corset. The first case had completely healed after more than 10 years, and the second, with multiple foci, was much improved after 2 years of immobilization.

WERNER M. SOLMITZ, M.D.

A Contribution to the Etiology of the Protrusion of the Acetabulum (Ein beitrag zur etiologie der protrusio acetabuli). FR. W. HAYD. *Zschr. Orthop.*, 1949, 79: 60.

This report is based on the history and clinical examination of 34 patients who have been under treatment for almost 12 years because of pain in the hip joint. The condition present was one of two distinct types: (1) that caused by an infectious process within the hip joint, and (2) a slow develop-

ing form which usually did not cause any subjective complaints for a long time.

The author discusses the anatomy of the hip joint with particular reference to the inclination of the acetabulum. More than two-thirds of the surface of the femoral head articulates with the acetabulum under normal circumstances. The articulating surface of the acetabulum is made up of a bony portion and a cartilaginous portion inserting on the acetabular rim. The migration of the acetabulum into the pelvis (Otto's pelvis) by protrusion of the femoral head into the acetabulum causes limitation of motion of the hip joint particularly in abduction, and in internal and external rotation. Flexion, on the other hand, is not impaired. This condition very often leads to lordosis of the lumbar spine and is associated with pain in that area. In the fourth and fifth decades the formation of osteophytes is observed around the femoral neck, which usually assumes a characteristic pattern. The osteophytes form a collar around the entire femoral head.

Usually women are afflicted much more often than men and the condition is usually bilateral. Very little has been added since the first description of this condition by A. W. Otto in 1824. He thought that it was due to a certain type of gout. Since then a number of conditions have been made responsible for Otto's pelvis, viz., premature closure of the "Y" epiphysis in the acetabulum, hereditary influences, disturbed ossification of the acetabulum, dysplasia of the acetabulum and femoral head, and torsion and abnormal inclination of the acetabulum.

The author believes that the anterior migration of the acetabulum, the forward tilting of its articulating surface, the body weight, and the tone of the muscles forced the head into the acetabulum. Coxa vara is very often associated with this deformity and is in itself another contributing factor in the development of Otto's pelvis.

It was generally believed that this condition was due to a softening of the bones of the acetabulum after which the femoral head pushed the acetabulum into the pelvis. A similar explanation was offered for the development of subluxation and dislocation of the hip joints. Otto's pelvis is usually found in women, is usually bilateral, and presents a very similar roentgenogram. GEORGE I. REISS, M.D.

Morton's Disease. A Clinical and Pathoanatomical Study. N. RINGERTZ and L. UNANDER-SCHARIN. *Acta orthop. scand.*, 1950, 19: 327.

Morton (1876), Tubby (1896), Tubby and Jones (1898), Hertzler (1926), Hoadly (1893), Betts's (1940), McElvenny (1943), King (1946), Bickel and Dockerty (1947), and Nissen (1948) are only a few of the many contributors regarding the present concept of Morton's disease. Hoadly was among the first to suggest resection of the interdigital nerve for Morton's toe, but it was not until 1935 (40 years later) that an English surgeon, Sir Harold Stiles, underwent resection of a neurofibroma for a long-standing Morton's toe.

The pathogenesis of the disorder has been alleged to be: (1) fibrosis of the third or fourth interdigital nerve of the foot, (2) neurofibroma, (3) neuroma, comparable to amputation neuroma (Baker and Kuhn), (4) edema, fibrosis, demyelination, and cyst formation (Bickel and Dockerty), and (5) an ischemic lesion of the vessels followed by fibrosis of the interdigital nerves.

Of the 18 cases reported by the author, 14 occurred in women and 4 in men. The occupations of these patients were noncontributory to the lesion.

The symptoms were chiefly those of burning pain, cramps, and a feeling of numbness. Pain was made worse by ambulation. Relief was obtained by removal of the shoe. In some cases intermittent pain occurred spontaneously. Objectively, the findings were not remarkable. Among the 18 cases, Morton's toe was elicited in the third toe in 14 patients, in the second in 2 patients, and in the fourth interdigital nerve in 2 patients.

The treatment instituted was that of removal of the affected nerves. The results were classified as: (1) subjectively completely cured—14 cases (77.8%), (2) subjectively improved—3 cases (16.7%), (3) subjectively unchanged—1 case (5.5%).

While the results of operation for Morton's toe appeared satisfactory, good results cannot be expected in metatarsalgia. The authors failed to achieve any beneficial effects with this operation on 5 patients with metatarsalgia.

Pathoanatomical studies of specimens obtained from the 18 cases were divided into 4 groups, namely, (1) fibrosis, (2) endoneural edema, (3) demyelination of the nerve, and (4) vascular changes. A control study of the surgical specimens with those of cadavers disclosed similar pathological patterns in certain aspects. Fibrosis, intraneural edema, and demyelination were found very infrequently in the autopsy material, but by and large the endarteritis fibrosis complex was commonly observed in patients past the age of 40. The authors do not concur with the concept postulated by Nissen.

SAMUEL L. GOVERNALE, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Total and Subtotal Synovectomy in Chronic Synovitides and Generalized Chondromatosis (Die totale und subtotale Synovektomie bei chronischen Synovitiden und generalisierter Chondromatose). F. KROH. *Chirurg*, 1950, 21: 1.

The difference between total and subtotal synovectomy, according to Kroh, is that in the latter, when applied to the knee joint, the posterior medial and lateral capsular sacs are not excised. In his experience, total synovectomy is indicated in chronic nonspecific unilateral and bilateral synovitis which has resisted conservative treatment and partial resection of the synovial membrane, in generalized chondromatosis of the synovial membrane, and in the exudative form of synovial tuberculosis; in other

words, in those cases in which the entire articular cavity is involved by any of these diseases.

Kroh has performed synovectomy in 34 cases including 28 knee joints, 4 finger joints, and 1 joint each of the big toe and of the shoulder. Total synovectomy was used in all joints, except 9 joints of the knee. Cases of histologically proved nonspecific chronic synovitis dominated the series, which also included 5 cases of tuberculous synovitis and 2 cases of generalized chondromatosis. In nonspecific chronic synovitis, thickening of the synovial membrane, or the presence of numerous hypertrophic villi indicated total resection; when the villi were not particularly numerous, the two posterior capsular sacs were not eradicated. In tuberculous synovitis, the presence of numerous villi, tuberculous granulations, and chondrolysis indicated total synovectomy; cases which at operation showed numerous villi in the anterior capsular sacs always presented marked villous formation in the two posterior capsular sacs. Subtotal synovectomy may be reserved for the less advanced cases of tuberculous synovitis, but the subsequent course of these cases must be carefully controlled and the posterior capsular sacs must be operated upon when the slightest suspicion of involvement arises. The form of generalized chondromatosis which constitutes an indication for total synovectomy is that which is characterized by the presence of free cartilaginous bodies in the articular cavity and of mouse nests in the subintimal layer of the articular capsule.

Of the 19 cases of nonspecific chronic synovitis of the knee, in which total synovectomy was performed, 14 are regarded as completed; the joints of 12 of these are freely movable, which means that they can be actively flexed up to an angle of 40 degrees and actively extended to a straight line; the other joints can be flexed to 65 and 120 degrees, respectively. Of the 5 patients who are still under treatment, 4 will have freely movable joints, in the above meaning, and the fifth patient will have active flexion up to 80 degrees. In the 7 cases of nonspecific chronic synovitis of the knee in which subtotal synovectomy was performed, the joint is freely movable in 6 cases and reaches a flexion of 80 degrees in the seventh case. Total synovectomy of the 4 finger joints and of the basic joint of the big toe was completely successful. In the 5 cases of tuberculous synovitis of the knee, total synovectomy gave excellent results in 2 cases and primary healing with ankylosis at an angle of 170 degrees in 1 patient, while subtotal synovectomy gave active flexion to 60 degrees in 1 case and a freely movable joint in the other. Total synovectomy in generalized chondromatosis resulted in flexion up to 120 degrees in one case and in complete restitution of active flexion and extension in the other. Total synovectomy of the shoulder joint allowed the patient to resume his former work.

Functional treatment must be started the day after operation. Therefore, before the operation is undertaken every patient is instructed thoroughly concerning the significance and the function of the quadriceps muscle; he must be made to understand that the fate of his entire extremity is dependent on the functional treatment of this muscle and that his co-operation is imperative.

RICHARD KEMEL, M.D.

Operative Treatment of Closed Injuries of the Spine without Nervous Disturbances (Trattamento cruento dei traumi chiusi del rachide senza turbe nervose). CARLO PAIS. *Chir. org. movim.*, 1950 34: 1.

This study is based on many published works, on information asked directly from about 300 foreign and Italian surgeons, and on the experience accumulated in 50 years at the Rizzoli Institute of Bologna in the treatment of 600 closed fractures of the spine. Reducing the fracture, maintaining the reduction, and re-establishing function constitute the basic criteria of the nonsurgical treatment; when treatment does not succeed in filling these requirements, it may be advisable in some cases to institute operative treatment. This should never be immediate or systematic but only complemental to orthopedic treatment, except in rare cases of hooking of the articular apophyses, which prevents reduction, and of intraspinal bone fragments. Surgical treatment may be early or late: early when applied within the third week following the trauma, and late after this period.

Early surgical treatment has been employed in the form of operative reduction, bone transplantation and osteosynthesis, and removal of free fragments. The indication for early surgical reduction of fracture-dislocation with hooking of the articular apophyses is now generally accepted. The author's experience in 7 cases was satisfactory. He does not favor systematic early bone graft with the sole object of preventing secondary displacements, Kuemmell-Verneuil pseudarthrosis, or posttraumatic arthrosis, but limits it to the exceptional cases of unstable reduction after articular apophysectomy or of recurrence with resulting grave danger after plaster cast treatment, especially in fracture-dislocation of the first two cervical vertebrae. In exceptional cases, he uses early bone graft in comminuted fracture of several vertebral bodies with serious deformity which cannot be corrected because it is seen after the first few days or because it is a recurrence. He does not consider osteosynthesis with wire or metal plate as a method of choice, but uses it only when the patient cannot stand a protracted operation. He finds early removal of fragments of the arches and of the transverse, articular, and spinous apophyses unjustifiable because orthopedic treatment gives excellent results in these cases.

Late surgical treatment has been used in the form of arthrodesis and the removal of fragments. The former is indicated in fracture-dislocation of the first two cervical vertebrae and also of the other five, although secondary displacement in the latter is less frequent and less serious than in the first two; in

fracture of the thoracic and lumbar spine; in painful vertebral arthrosis secondary to fracture if there is no herniated disc; in spondylolysis and spondylolisthesis; and in pathologic fracture of the spine from osteoporosis, malacia, or myeloplast tumor. Late removal of fragments may be indicated for the spinous apophyses because of pain following pseudarthrosis or for esthetic reasons, for the transverse and articular apophyses because of secondary disturbances, and for the coccyx because of posttraumatic coccygodynia, which is rare.

RICHARD KEMEL, M.D.

Vertebral Osteosynthesis by Wilson's Technique (L'osteósynthèse vertébrale par la technique de Wilson). J. CREYSSEL. *Mem. Acad. chir.*, Par., 1950, 76: 160.

On the basis of his limited experience, Creyssel thinks that Wilson's method has far greater possibilities of application than in the painful lumbosacral syndromes due to abnormal mobility of the fifth lumbar vertebra for which it was devised. For instance, he has used it in two cases of old fracture of the vertebral body in which, despite reduction by the method of Boehler, pain persisted.

In one case, a man of 48 had a fracture of the twelfth thoracic vertebra dating back 6 months. With a four-bolt plate and a tibial graft it was possible to fix solidly the eleventh thoracic vertebra to the first lumbar vertebra.

In the second case, a man of 68 had a fracture of the sixth thoracic vertebra which had remained cuneiform despite attempts at reduction in lordosis, and which dated back 5 months. A four-bolt curved plate was applied with a tibial graft from the fifth to the eighth vertebrae.

Even more interesting is the case of a feebleminded, debilitated man of 59, with an unstable luxation of the cervical spine, who tolerated the cast badly. With misgivings, a three-bolt plate was applied from the third to the seventh cervical vertebrae, but roentgen examination showed solid fixation despite absence of reduction, thus allowing elimination of the external apparatus.

In a case of painful inveterate scoliosis in which no effective reduction could be expected, Creyssel has combined the use of a long Wilson plate for the lower zone with a Hibbs plate for the upper zone; unfortunately, skin necrosis probably due to compression by a corrective corset during the operation in a debilitated subject, has forced removal of the prosthesis for fear of an infectious accident. In a case of Pott's disease he has used the method to decrease the inconveniences of insufficient immobilization in a woman 71 years of age, who was very unco-operative and could not be kept in plaster. This indication will naturally be rare.

Since the field of application of Wilson's method may become quite large, it would be desirable to simplify its technique and to improve its instruments. Therefore, Creyssel has replaced the bolts by tubular rivets with use of the following instruments: a punch which perforates the base of the spinous process, tubular rivets with flat head passed through the graft, the spinous process and the plate, and a crushing forceps which flattens the protruding portion of the rivet on the plate. This makes it possible to obtain with one rapid gesture the same solid fixation as that provided by slow screwing of the nut on the bolt.

RICHARD KEMEL, M.D.

Arthrodesis in the Treatment of Coxalgia (La artrodesis en la coxalgia). D. FERNÁNDEZ YRUEGAS. *Cirug. ap. locomotor*, Madr., 1950, 7: 1.

The evolution of coxalgia, which is part of generalized tuberculous infection, depends on the same factors which influence the individual reaction of the entire body. This reaction is dominated by constitutional factors, especially the hereditary factor.

The author limits his discussion to the local treatment of coxalgia. Tomographic studies are essential for determination of the extent of the lesion. Streptomycin shortens the preoperative preparation and allows surgical intervention at an earlier period of the disease than before the introduction of antibiotics.

Total extirpation of the lesion can be contemplated only in exceptional cases. As a rule, arthrodesis is the method of choice. Pegs of os novum proved superior to grafts of the tibial cortex because their osteogenetic properties are greater. In 24 of 27 patients a complete bony ankylosis was obtained after ischiofemoral arthrodesis.

The author doubts the value of subtrochanteric osteotomy as a supplement to iliotrochanteric arthrodesis.

Invasion of the os ischii by the tuberculous process is the sole contraindication to the utilization of this bone for grafting.

JOSEPH K. NABAT, M.D.

Rotation Plasty for Congenital Defects of the Femur. Making Use of the Ankle of the Shortened Limb to Control the Knee Joint of a Prosthesis. C. P. VAN NES. *J. Bone Surg.*, 1950, 32-B: 12.

Several varieties of hypoplasia or congenital absence of part of the femur are seen in orthopedic practice. There may be delayed development and shortening of the whole femur with subluxation of the hip or knee joint, but sometimes subluxation occurs with these joints well developed. In other cases the lower end of the femur may be present, but the upper end is luxated and not differentiated into a head and neck. Finally, the middle part of the femur may be absent, the short proximal fragment being abducted and the knee joint situated just below the hip. In every type of congenital defect of the femur, there is severe shortening of the thigh so that the ankle joint of the short limb approximates the level of the knee joint of the normal side.

Because of these abnormalities, a prosthesis is merely a pylon. It is difficult to use because it is cumbersome and rigid.

The author has devised an approach to this problem. First, he corrects the pseudarthrosis or the

luxated hip. Next, he fuses the knee because it is in a useless position just under the hip. During these two steps, every attempt is made to gain 180 degrees of rotation of the ankle. Should this rotation not be fully gained, a rotation osteotomy is performed. In 2 instances the thigh was shortened a few centimeters in order to bring the ankle opposite the level of the normal knee. By this procedure, the ankle joint can be utilized as an active knee joint. The foot serves as a partial bearing surface.

Three cases with 8 to 10 year follow-up studies are reported. One patient was 7 years old and the 2 others were 18 years old at the time reconstruction was started. All of the patients were greatly benefited and could follow their normal pursuits. Other patients have been treated similarly, but the follow-ups have been incomplete because of the recent war.

KENATH H. SPONSEL, M.D.

FRACTURES AND DISLOCATIONS

Metal Fixation of Fractures in the Trochanteric and Subtrochanteric Region (Enclavijamiento metalico en las fracturas de la region trocanterea y subtrocanterea). IGNACIO GOROSTIDI ERRO. *Cirug. ap. locomotor*, Madr., 1950, 7: 70.

Nailing was employed by the author in 12 patients with trochanteric or subtrochanteric fractures. Satisfactory results were obtained in 8 of them.

The method furnishes excellent anatomic as well as functional results. Decubital ulcers, a frequent complication of other therapeutic procedures, are avoided. Early ambulation, shortening of convalescence, and low mortality are other advantages of this method.

Nailing is recommended for the treatment of transtrochanteric and subtrochanteric fractures, while in the pertrochanteric type it is indicated only if the external fragment is sufficiently large to support fixation. Perfect coaptation of the external lamina with the femoral diaphysis is essential for good results. JOSEPH K. NARAT, M.D.

Histologic and Biochemical Experimental Studies of the Processes of Repair of Fractures in the Dog (Étude expérimentale, histologique et biochimique de la réparation des fractures chez le chien). R. FONTAINE, A. CHEVALLIER, P. MANDEL, and E. WIEST. *Lyon chir.*, 1950, 45: 145.

The second metatarsal in these dogs was sawn through with the Gigli saw and the animal permitted to run about without a cast. None of the dehiscences united during the time before the animal was sacrificed for purposes of study (up to 3 months). However, when the tibia was the bone in which the solution of continuity was artificially produced and the fracture was immediately fixed by means of a Kuentscher intramedullary nail, the consolidation was complete within a few weeks. In the unhealed cases there developed a chondroid tissue (not true cartilage) between the bone ends, but in the healed bone there was never any evidence of cartilage or chondroid tissue formation. From this finding the author concluded that the presence of cartilaginous or pseudocartilaginous tissue in and about a fracture is always a sign of abnormality and indicates a poorly healing break.

In some of the pegged tibias the consolidation was so firm that the Kuentscher nail could not be withdrawn; the bone had to be exposed and split down the center. When this was done it was found that dense bony tissue had enveloped the nail at the level of the fracture and had extended for 2 or 3 cm. along the marrow cavity in both directions from the fracture line. The authors believe that this is the first time that this additional proof of the participation of the endosteum in the process of bone healing has been noted in the literature.

In the healed cases the hematoma of the fracture bed was either absorbed or replaced by a cell-rich connective tissue. This tissue then underwent a process of calcification, or ossification, directly without the intermediation of any other form of tissue. This new bone formation fairly leaped across the dehiscence between the bone ends, and complete ossification seemed to occur within a few days.

During this process of healing the roentgenogram would show a slight decrease in shadow intensity at the point of fracture and this would spread variously; however, in the dog it always remained a local manifestation, never involving the bones of the opposite limb and never, as in the smaller animals, spreading to the entire skeleton. Since from other reports this localization of the osteoporotic process seems to be characteristic of the rabbit also, the author postulates that the phenomenon is a characteristic of larger animals or mammals. This, of course, includes the human being.

The author believes that the slight decrease in the mineralization index (Ca/P, Ca/N, and P/N) and the marked increase in the value of phosphatase in the region of the fracture substantiates the described roentgenologic findings. JOHN W. BRENNAN, M.D.

ORTHOPEDICS IN GENERAL

The Operative Treatment of Suppurative Lesions of the Bony Pelvis. JACOB KULOWSKI, EDGAR O. HICKS, and ARTHUR STEINDLER. *Am. J. Surg.*, 1950, 79: 405.

This report is based on 43 cases of pyogenic lesions of the bony pelvis, 15 of which involved the sacroiliac region, 10 the ilium, 8 the ischium, 4 the pubes, 3 the sacrolumbar area, 1 the sacrum, and 1 the coccyx. Some patients had multiple foci of infection. Infections of the sacroiliac region usually occurred in the older age groups. Perforations of its cartilaginous covering were found; these make this joint particularly susceptible to infection.

Patients who were operated upon soon after admission to the hospital responded very well. The later the surgical intervention was performed, the poorer the result. The operative results in the chronic stages were poor, with death in 6 cases.

The operation usually consisted of incision and drainage, and as much bone as possible was left *in situ*. In several cases resection of the bone was done. There was 1 death of an older individual. One patient died of peritonitis. There was no disturbance of the gait after resection of these bones. Secondary ankylosis of the hip joint caused some disturbance of the normal gait.

GEORGE I. REISS, M.D.

Critical Analysis of the Pain Mechanism in Amputees. New Therapeutic Trends; Prophylactic Measures (Étude critique des mécanismes de la douleur chez les amputés. Nouvelles orientations de son traitement. Prophylaxie. RENÉ LERICHE. *J. chir.*, Par., 1950, 66: 5.

The cause of pain in amputees is still not explained. However, the facts point to the pathologic change in the nerve scar connected with possible changes in the thalamus. The reason that the type and onset of pain is so unpredictable lies in the reaction of the nerve scars. It is generally agreed that when centripetal nerve fibers which are fused into a nerve scar or neuroglioma are irritated by motion they may be the center of pain, but such an assumption does not explain why the pain rhythm is very irregular; i.e., it occurs at intervals of days, weeks, or months. It is also necessary to differentiate the stump pain from the pain in the absent member (phantom pain).

The stump pain is characterized by three features: it is an aching, irritative sensation without severe pain; it is diffuse and is present around the stump only; and it is accompanied by vasomotoric and trophic changes.

The trophic changes are edema, ulceration, skin creases with hyperkeratoses in which neuromas are sometimes found; 1 case showed an arteriovenous anastomosis with neuromuscular hyperplasia. The neuromas around the scar along the nerve ramifications are possibly the result of pre-existing vasomotor changes in the stump covering. Consequently, Leriche concludes that the vasomotor changes are the cause of the pain, especially as the pain does not follow a topographic pattern and ceases routinely after sympathectomies. The temporary blocking of the sympathetic ganglion is sufficient to interrupt the motor reflex arc. Excellent arteriographic studies form the basis for speculation that there are analogous venous short circuits in the arterial system and long capillary loops and networks between the bone and the skin cover, possibly representing the source of the vasomotor disturbances.

The phantom pain at the level of the absent member is characterized quite differently by the following signs: the pain is constant, is localized in the periphery, and recurs after the blocking wears off. These changes do not originate in the cerebrum. The anesthesia dolorosa and the pain in the amputee have an identical mechanism. With nerve blocking the phantom pain ceases completely. Blocking of the stellate ganglion is followed by a heat sensation which causes a feeling of cold in the absent member; the same sensations accompany novocain injections in the subclavian artery. The phantom pain is the result of irritations, conscious or unconscious, traveling constantly in the sensory fibers in the same manner as in the intact member. The patient does not realize the absence of a certain extremity. The nerve fibers examined will reveal the presence of a neuroma or of inflammatory changes on the basis of circulatory pathology. In the stump one finds either gliomatous hypertrophy or proliferation of the neural cylinder. On finding the neuroglioma, Leriche injects 20 c.c. of novocain, dissects it with an electric knife and inserts a Carrel drain. The wound is closed around the drain and during the next 15 days 10 c.c. of 1 per cent novocain are injected into the drain which produces saturation with novocain.

The few patients treated by such a method showed very encouraging results. The method is simple and harmless and seems to prevent the onset of pain. The amputation should be considered from the neurosurgical angle and done with the electric knife which seems to prevent excessive neurogenesis.

ERNEST H. BETTMAN, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Congenital Arteriovenous Fistulas (Fistulas arteriovenosas congenitas). ALBERTO S. BENCHIMOL and JUAN B. MONTERO. *Prensa méd. argent.*, 1950, 37: 187.

The authors point out that the diagnosis of congenital arteriovenous fistula is not infrequently missed although the necessary diagnostic criteria are usually present. This disease results from failure of differentiation of the common anlage into artery and vein.

The fistulas are usually found in the extremities but they may be located in other sites. Varicose veins are almost invariably present, and the appearance of these at an early age or in an unusual location should make one suspect the diagnosis. Birthmarks are frequently present. The extremity affected is usually longer and larger than its companion. There is increased warmth of the skin on the fistulous side. Because of the small size of the communications, thrills and bruits are not present. The oxygen saturation of the venous blood from the affected side is greater than that of the other side. Arteriography may be of help in localizing the site of the fistulous communication.

Treatment is difficult and consists of the use of elastic stockings, sclerosing agents, radium and radiation therapy, and surgical correction. Surgery is usually not possible because of the numerous communications and their small size.

The authors report 2 cases of congenital arteriovenous fistula: one in a female patient 60 years old, treated unsuccessfully for varicose veins for years, and the other in a male patient 38 years old. Surgical correction was not possible in either case; therefore various conservative methods were used.

JESSE E. THOMPSON, M.D.

Endarteritis Obliterans (Obliterative Endarteritis). DAVID W. KRAMER. *Angiology*, 1950, 1: 53.

The case records of 3,800 patients from the vascular clinics of the Jefferson and Philadelphia General Hospitals, in Philadelphia, were reviewed. Fifty-seven cases of endarteritis obliterans were found. The study of this group of cases forms the basis of this report.

Endarteritis obliterans is a peripheral vascular disorder that has a gradual onset, attacks the smaller distal vessels, runs a progressive course with trophic soft tissue disturbances, and frequently results in ulceration and gangrene.

The etiology is not definitely established but there is evidence that infection, repeated irritative inflammatory conditions, and frostbite may be contributory factors.

The onset of the disease is gradual. Either sex may be attacked, but the condition is predominant in males. Unlike thromboangitis obliterans, this disease may occur in the colored race. Persons of all ages are affected, but in 43 per cent of the cases in this series the disease occurred in the fifth decade. Forty-seven per cent of the lesions occurred in the lower extremity and 45 per cent occurred in the upper extremity. Seven per cent of the patients showed involvement of both upper and lower extremities.

Pain is the most common symptom. It may be quite intense and is usually limited to the involved areas. Coldness and numbness were complaints in about 50 per cent of the patients. Cramps, most likely due to arteriospasm, were prevalent. In the early stages, the tip of the involved extremity is usually red, edematous, and quite tender. Later, cyonosis and ulceration are seen. Dry gangrene limited to the digits was noted in 23 of the 57 patients. Occasionally, the condition extends and rapidly involves the entire limb. Oscillometric readings were diminished in approximately 20 per cent of the cases. Arterial pulses in the affected extremities were absent, or diminished, in 24 per cent. The capillary response to histamine showed unimpaired readings in most instances. The Wassermann reaction was positive in a relatively large number of cases studied serologically.

Differential diagnosis in the upper extremity includes Raynaud's syndrome, scleroderma, frostbite, and thromboangitis obliterans. In the lower extremity Raynaud's syndrome, thromboangitis obliterans, arteriosclerosis obliterans, diabetic atheromatosis, and embolic occlusion must be differentiated.

No discussion of therapy is given. It is emphasized that the diagnosis was based on the clinical course, particularly in the presence of ulceration or gangrene, and in patients in whom the pulses were good and in whom the circulatory function tests indicated satisfactory circulation. In contrast to Buerger's disease, the smaller instead of the larger vessels are involved, and the differences in sex and race incidence do not exist in obliterative endarteritis.

CURTIS ARTZ, M.D.

Embolectomy from the Abdominal Aorta. HOLLIS L. ALBRIGHT and FIELD C. LEONARD. *N. England J. M.*, 1950, 242: 271.

One hundred and ninety saddle emboli at the aortic bifurcation have been reported to date. To these is added 3 cases, making a total of 193. Two of the 3 patients were treated by embolectomy, and 1 by supportive measures, including lumbar sympathectomy without removal of the embolus. Amputation of a leg was required in 1 case, in which embolectomy was performed 30 hours after onset. The circulation of the leg was restored in the other cases—in 1 case with, and 1 without removal of the embolus.

Undoubtedly, many more aortic emboli have occurred than have been reported. In several reports aortic thrombosis has been confused with aortic embolism. Of the 193 patients, 144 died as a result of the embolus; 26 patients were cured by direct or indirect embolectomy; 11 patients survived after amputation; 8 patients were cured by conservative measures short of removal of the embolus, and 4 cases were reported as "spontaneous cures without any treatment."

The term "cure" is considered to mean complete restoration of circulation to both legs for a period of at least 3 weeks after operation with no loss of tissue as a result of the disturbed circulation.

Conservative treatment includes all therapy other than embolectomy—namely, the vasodilator drugs, the anticoagulants, heparin and dicumarol, sympathetic nerve interruption, Buerger's exercises, intermittent venous occlusion, and cooling of the extremities to lower their metabolism. These measures may prove extremely important as ancillary treatments after the embolectomy. In one of these 3 patients bilateral lumbar sympathectomy was combined with removal of the embolus.

The relation of time elapsed between peripheral embolism and embolectomy as related to survival is shown. Six to 8 hours' delay appears to be the upper limit permissible for best chances of survival of the limb. Among the 26 successful aortic embolectomies, the delay was recorded in 21 cases. In 16, or 76 per cent, of the successful cases operation was performed within 6 hours. Nineteen patients were operated on within 10 hours, and the remaining 2 were operated on at 21 and 23 hours, respectively. Certainly, successful outcome seems to be related to early intervention—namely, within 6 hours—in the face of the discouraging prostration of the patient.

Peripheral arterial emboli tend to lodge at the aortic bifurcation in 4.5 to 8.7 per cent of the cases. The heart with auricular fibrillation or myocardial infarction was the major source of 172 arterial emboli in 98 patients seen at the Massachusetts General Hospital, Boston, from 1937 to 1946 (Warren and Linton). In rare cases syphilitic aortitis, aortic aneurysm and atheroma, intracardiac thrombosis in the congested heart, and pulmonary-vein thrombosis have led to embolus. Thrombosis in a closing ductus arteriosus (Gross), vegetations on an anomalous heart valve, spontaneous clotting in the polycythemia of "blue babies," myxoma fragments from a myocardial tumor (Young and Hunter), and a migratory bullet (Cooper) have given rise to emboli.

"Paradoxical emboli" were first described by Cohnheim in 1877, his case being associated with a patent interauricular foramen ovale. Other paradoxical emboli from the venous circulation have transversed an interventricular septal defect (Birch).

Several important points are illustrated in one of these patients. Diagnostically the "five P's" of arterial embolism were present: pain, pallor, paralysis, pulselessness, and paresthesia. Therapeutically, two "don'ts" in arterial embolism were demonstrated: avoidance of elevation of the limb and of local application of heat. Depression of the ischemic limb allows the diminished blood supply entering it to remain longer. Locally applied heat, by increasing the local tissue metabolism, resulted in a third-degree burn in this patient even though the electric pad was on the "low" position for 3 days.

The direct approach to the aorta in this patient, aided by a proximal soft-rubber tourniquet, in the absence of desirable Bethune vascular clamps, enabled direct control of the embolus, with no troublesome bleeding and removal of the extension of the clot. Had distal tourniquets or clamps been applied on each iliac artery and the contained clot, fragmentation might have occurred, with possible peripheral dissemination if the fragments were not completely removed. The soft-rubber tourniquet recommended itself here over more special devices only because of its availability and simplicity, and because it worked.

Transabdominal bilateral lumbar sympathectomy at the time of embolectomy may prove advantageous when the operating time is not unduly prolonged and the patient's condition permits.

JOHN E. KIRKPATRICK, M.D.

Ligation of the Common and Internal Carotids (Ligadura de las carótidas primitiva e interna). TEÓFILO J. OÑATE. *Bol. Inst. clín. quir.*, B. Air., 1949, 25: 44.

The principal indications for ligation of the carotids are traumatisms (wounds by firearms or cutting instruments), hemorrhage, aneurysm, tumor, certain dissections of the cervical lymph nodes, and pulsating exophthalmos. The ligation may be followed by a normal course or it may cause immediate, mediate, or late accidents.

At the time of ligation or immediately after it, the patient may experience a fainting sensation accompanied or not by chills, nausea, and amaurosis; these symptoms are sometimes associated with homolateral headaches, partial or complete aphasia, and contralateral hemiplegia with anesthesia and paresthesia. These manifestations may be temporary or permanent, leaving the patient with hemiplegia with or without aphasia, amaurosis, and mental disturbances. Sometimes the symptoms may precede slow and deep respirations, generalized convulsions, and death.

Mediate accidents may occur within 48 hours after the operation and consist of grave cerebral disturbances, hemiplegia, coma, or death.

Late accidents may occur up to 8 months after the operation and consist of hemiplegia, generally localized in the upper extremity and face, and preceded or not by attacks of generalized convulsions.

The theories advanced to explain the cerebral disturbances include those of ischemia through failure of the collateral circulation, especially by anomalies in the circle of Willis; ischemia through vasoconstriction due to sympathetic irritation; thrombosis and embolism; circulatory stasis; intracerebral hemorrhage; and stimulation of the carotid sinus. This

situation is maintained by the impossibility of observing the human brain under experimental conditions and by the autopsy findings that are confusing and contradictory. On the other hand, the conclusions drawn from animal experimentation are not always applicable to human beings. In addition, it is probable that one factor alone is not responsible for the lesions, but that several factors act together.

To avoid accidents and in accordance with the theory favored by the individual surgeon, a number of different procedures have been adopted to obtain interruption of the blood stream in the carotids. The most rational is that of ligating and resecting a portion of the common carotid and simultaneously ligating the internal jugular vein; this is or is not associated with ligation of some collaterals of the external carotid. Ligation of the internal jugular vein has given rise to controversies; its action would be that of compensating cerebral anemia. It is a fact, however, that ligation of the common carotid in wounds of this vessel results in from 40 to 50 per cent mortality, which is reduced to 20 per cent when the internal jugular vein is also ligated. In ligation for aneurysm the 10 per cent mortality is reduced to 5 by simultaneous ligation of the jugular vein.

The prognosis of these ligations must always be reserved. In Oñate's 11 cases, there were 8 survivals and 3 deaths. The operation is best tolerated by young patients without vascular and organic changes, since their compensating mechanisms can act rapidly and efficiently. RICHARD KEMEL, M.D.

Ninety Aortographies of Arteritic Lesions of the Iliac Arteries and Aorta (Lésions artéritiques des iliaques et de l'aorte d'après 90 aortographies). R. LERICHE, J. KUNLIN, and C. BOÉLY. *Lyon chir.*, 1950, 45: 5.

Aortography reveals parietal lesions and thrombosis of the iliac arteries and the terminal portion of the aorta. Ninety aortographic films were studied by the authors. The iodine tolerance test precedes the study. A needle from 12 to 14 cm. in length is introduced from 6 to 8 cm. to the left of the first and second lumbar vertebrae, just below the left twelfth rib, from 50 to 60 c.c. of the contrast medium are injected, and a picture is taken immediately.

Ninety aortographies were made in 3 groups of patients: (1) those with arteritis and absence of the femoral pulse on one or both sides, (2) those complaining of fatigue and weakness of the legs, without signs of arteritis but with a palpable femoral pulse and a normal oscillographic index, and (3) those from 35 to 46 years of age, complaining of loss of erection.

Thrombosis was found with equal frequency in the common and the external iliac artery while the hypogastric artery was never primarily involved. Thrombus of the common iliac artery was usually found in its upper portion, extending sometimes into the aorta. Arteries affected by thromboangitis were never tortuous or dilated. In some patients the entire common and external iliac artery and also the femoral artery were occluded by a thrombus.

Irregularities of the lumen of one or both common iliac arteries were found in patients of the second group, without clinically detectable signs of arteritis.

In 5 patients of the third group (15 patients complaining of loss of sexual power), tortuosities and dilatation of the iliac arteries were found.

JOSEPH K. NARAT, M.D.

Gangrene of the Heel. SAUL S. SAMUELS. *Angiology*, 1950, 1: 46.

Gangrene of the heel occurs in about 5 per cent of all cases of peripheral gangrene. Usually it exists independently, but often it is associated with gangrene of the toes and other parts of the foot. It affects males and females equally.

There are two types of gangrene of the heel. One is the simple decubitus type which occurs bilaterally in elderly bedridden people, and is the result of pressure. The second type occurs as a result of a break in the skin of the heel and subsequent infection.

Treatment of both types consists of bed rest, elevation of the extremity, and careful débridement so as to rid the area of necrotic epithelium and slough and prevent the pocketing of pus. Antibiotics should be used in combination. Drainage of pus from deep pockets can usually be done with sharp scissors without anesthesia.

Relief of pain is usually a problem in patients with gangrene of the heel. Narcotics are usually ineffective. The author has had good results with a new synthetic analgesic (3-hydroxy-N-methylmorphinan) in doses of 2.5 to 5 mgm. hypodermically every 8 hours. There is insufficient experience with this new drug to determine whether or not it is habit-forming. The author also recommends the liberal use of aspirin and whisky to control pain.

In those cases in which the ability of the arteries to constrict has not been lost, vasodilating drugs may be of some value. The author has had good results with beta-pyridylcarbinol. This drug is converted to nicotinic acid in the body and in most cases produces a feeling of warmth. The dose is 100 mgm. orally or intramuscularly, two or three times a day.

In order to aid in the separation of gangrenous tissue from healthy tissue, the author recommends the use of foot soaks of green soap and water. After the slough has separated epithelialization may be aided by the local application of panthenol, the alcohol corresponding to pantothenic acid.

Amputation of a leg for gangrene of the heel should not be considered unless all conservative measures have proved ineffectual.

FREDERICK W. PRESTON, M.D.

Postphlebitic Syndrome. Treatment by Conservative Measures, Sympathectomy, and Other Operative Measures. ALTON OCHSNER, MICHAEL DEBAKEY, PAUL T. DECAMP, IRVING M. RICHMAN, and Others. *Surgery*, 1950, 27: 161.

The authors stress the importance and seriousness of the postphlebitic syndrome, particularly when

inadequate treatment had been employed. They emphasize the point that in patients with venous thrombosis, inadequate treatment produces symptoms for years and frequently for the duration of life. Of 680 patients (reported by Zilliacus) who had phlebitis for a period of 6 to 14 years, 90 per cent had persistent discomfort and 20 per cent had ulcers.

Attention is directed to previous work wherein it has been demonstrated both clinically and experimentally that the symptoms in acute thrombophlebitis are caused mainly by spasm of the homolateral arterioles resulting from impulses originating in the thrombophlebitic segment, which are carried over the sympathetic nervous system to the arterial system. Interruption of the vasoconstrictor impulses in the acute phase of thrombophlebitis elicits beneficial vasodilatation, held to be of great value in the treatment of postphlebitic syndrome.

Since all patients are not improved by interruption of the vasoconstrictor impulses by sympathectomy or procaine anesthetization of the regional sympathetic ganglia, the authors describe a test devised to determine which patients might be benefited by vasodilatation. The test consists in carefully measuring the involved extremity circumferentially at five different levels, one just above the ankle, one at the knee, two on the thigh, and one at a prominent portion of the calf. The subject is asked to walk a mile at normal gait, is remeasured similarly, and procaine block of the regional sympathetic ganglia is performed. He walks the same distance, at the same rate of speed, along identical terrain, following which measurements of the phlebitic extremity are repeated, and comparisons with the two previous measurements are made. If decrease in size occurs after sympathetic block, it is assumed that vasospasm is a factor in producing edema.

When improvement occurs following procaine anesthetization of the regional sympathetic ganglia, measures to secure vasodilatation are initiated to remove vasoconstrictor influences, such as smoking, exposure to cold, and emotional upsets. Compression bandages (Ace, No. 8 lastex) are preferred over elastic stockings since the former can be applied firmly to fit the varying contour of the extremity from day to day, and before arising. Primarily, conservative measures are tried and if found to be ineffective the more radical measures are instituted, usually for the more severe cases. Sympathectomy was advised in less than one-half of those patients in whom vasospasm was responsible for persistence of symptoms. Of 600 patients treated, 246 with adequate follow-up for 6 months or longer were culled for study. In 76 of the 246 cases, the condition followed surgery; 40 cases occurred postpartum; 39 cases followed a severe infection, such as typhoid fever or pneumonia; 30 cases originated spontaneously and were of unknown etiology; 23 cases were posttraumatic; and in 9 cases the condition began as a thrombophlebitic process in varicose veins.

The greatest number of cases recorded occurred in patients in the third, fourth, and fifth decades; however, 10 per cent of patients were in the first two decades, and 16 per cent were over 50 years of age. Involvement was bilateral in 25 per cent of cases and about twice as common on the left side as on the right, since vascular stasis is greater in the left lower extremity.

For evaluation of therapy, the cases were classified according to severity, into four groups:

1. Asymptomatic—patients with no symptoms or signs of disease and no disability; observed only after therapy.

2. Mild disease—patients with mild to moderate edema, no significant complications, slight or no pain, and slight or no disability. All patients in this group obtained complete relief of symptoms by use of compression bandages.

3. Moderately severe disease—patients with moderate edema, no recurrent history of complications, mild to moderate pain, and disability limiting essential activities.

4. Severe disease—severe edema, moderate to severe pain, recent complications, and disability limiting essential activities.

Edema was present in all patients. Pain was present in 63.8 per cent, ulcers in 31.3 per cent, recurrent phlebitis in 24 per cent, and recurrent cellulitis or erysipeloid infection in 23.6 per cent. The duration of findings and symptoms was from 6 months to 10 years, or longer.

The basis of treatment consists of conservative measures to prevent vasoconstriction and to produce vasodilatation. In this series 57 per cent of patients were treated by conservative measures, 43 per cent had sympathectomies, and 21.5 per cent had other radical treatment. Of the 246 patients, 16.7 per cent became asymptomatic, 34.5 per cent were definitely improved, 42.3 per cent showed slight or no change, and 6.5 per cent became worse. Patients with increased venous pressure due to incompetence of the valves of the deep veins, or with extensive perivenous cicatrix, required deep venous ligation and frequently subfascial ligation of the communicating veins, the latter particularly in the presence of ulceration. Recurrent erysipeloid infections can be controlled by eliminating edema and preventing entrance of streptococci through the feet from epidermophytosis. JOHN MOHARDT, M.D.

The Pathophysiology and Treatment of the Lower Leg Stasis Syndrome. GUNNAR BAUER. *Angiology*, 1950, 1: 1.

The erect position in man causes venous overloading in the lower parts of the leg. In healthy individuals this superfluous blood is easily removed by contractions of the calf muscles, which act as a peripheral heart. This mechanism postulates normal functioning of the valves in the femoral and popliteal veins.

In patients with lower leg edema, induration, ulceration, and bursting pain, it has been demon-

strated that the afore-mentioned large veins are incompetent, their valves having been destroyed by previous thrombosis or by phlebosclerotic processes. In such cases superfluous blood cannot be effectively removed by contraction of the calf muscles, every relaxation of these muscles being immediately followed by a backflow of blood down the valveless main trunk. This results in permanent venous stasis, and is followed by pain and tissue changes.

The author recommends ligation of the popliteal vein as a remedy for this condition. After this operation the calf muscle contractions drive the blood through numerous fine-calibered channels into the muscle veins of the thigh, and no backflow can occur.

Popliteal vein division has been performed 194 times at the Mariestad Hospital in Sweden. The author has followed 156 cases from 3 months to 2½ years postoperatively. An uneventful recovery occurred in 84 per cent, a relapse in 11 per cent, and a serious recurrence of symptoms in 5 per cent.

FREDERICK W. PRESTON, M.D.

Results of Different Methods of Venous Ligation in the Treatment of Deep Venous Insufficiency of the Lower Extremity (Resultados de los distintos métodos de ligaduras venosas en el tratamiento de la insuficiencia profunda de la extremidad inferior). F. VIDAL-BARRAQUER. *Angiologia*, 1950, 2: 18.

The difficulties arising from deep venous insufficiency of the lower extremity, whether resulting from thrombophlebitis or "essential" varices, are basically due to the impaired or destroyed valves in the deep system. Treatment must therefore be directed toward correction of the valvular insufficiency. The author cites the concept of Piulachs as the basis for his method of therapy. According to Piulachs, the function of the valves of the veins of the leg is not only to direct the flow of venous blood in the proper direction and to prevent retrograde transmission of hydrostatic venous pressure, but also, and more important, to mitigate the waves of acute venous hypertension which occur with coughing, laughing, and abdominal straining, rather than allow these bursts to act directly on the capillary network at the distal end of the extremity, a condition which occurs with chronic venous insufficiency. The aim of treatment by phlebectomy is thus to attempt to restore the circulation across a venous network that lessens these intermittent bursts of venous hypertension.

The method used consists of phlebectomy in steps, under manometric control, the venous pressure induced by effort being used for testing. The superficial femoral vein is first exposed and a retrograde venogram is carried out. The venous pressure in the lower part of the leg is tested and the pressure induced by effort is recorded. The femoral vein is then ligated immediately distal to the profunda, 2 to 5 cm. being resected. The greater saphenous vein is also ligated and divided. The venous pressure induced by effort is again tested. If the pressure is still elevated or if the rise is rapid, the test is positive, and the popliteal vein is then ligated and divided, as is the lesser saphenous. Resection of the popliteal vein has usually been found necessary in addition to femoral interruption. The pressure induced by effort is again tested. If the test is still positive, the external iliac vein is ligated. This triple ligation was found to be necessary in only 1 case. The great saphenous vein is then stripped, provided the pressure in it does not exceed 25 cm. of water after the femoral and popliteal veins have been divided. If the pressure is 25 cm. or more, stripping is deferred until a later date.

Linton's method was used in 3 patients, Bauer's method in 4, and the method described (Piulachs') in 9 patients. The author recommends the last method. Results in the 12 patients followed up from 15 days to 8 months are reported. Although the follow-up period is short, the author reports 100 per cent cure of ulcers and varicose veins. Twenty-five per cent of the edema cases completely regressed, and 58.2 per cent showed improvement of varying degrees. Pain and venous claudication were relieved. Cellulitis was resistant to therapy. No recurrences were observed.

JESSE E. THOMPSON, M.D.

LYMPH GLANDS AND LYMPATHIC VESSELS

Lymphedema. GEZA DE TAKATS and MATTHEW H. EVOY. *Angiology*, 1950, 1: 73.

A study of 150 cases of lymphedema was conducted at St. Lukes Hospital, Chicago. Of these, 28 cases were classified as congenital, 11 as traumatic, 58 as inflammatory, 22 as degenerative (malignant), and 31 were of unknown origin. There were 35 males and 115 females.

Congenital lymphedema is usually associated with other congenital anomalies such as birth marks, hemangiomas, lymphangiomas, and lymphangiectases. By biopsy it was found that many lymph cysts were present in the subcutaneous, subfascial, intramuscular, peritendinous, and even in the retroperitoneal tissues. No inflammatory component was observed. In some cases of congenital lymphedema of the lower extremity, involvement of the buttocks, scrotum, and penis, indicating high obstruction, was noted. No proved cases of hereditary congenital lymphedema (Milroy's disease) were seen.

Traumatic lymphedema follows sprains, fractures, contusions, and lacerations in which there is a change in capillary permeability and an accumulation of tissue fluid. This results in an acute lymphedema which may be aggravated by hemorrhage, dependent position, tight bandage or cast, and secondary infection. Unless proper care is used to minimize the early edema, intractable irreversible fibrosis may result. Trauma to the regional lymph nodes in the axilla or groin may lead to lymphedema. Roentgen rays may also obliterate sinuses of lymph nodes and destroy lymph channels. Frequently a lymphorrhea develops in the groin following surgical trauma to the lymph nodes during vein ligations,

embolectomies, and operations for aneurysm. It is pointed out that this lymphedema may be effectively checked by doses of about 150 to 200 units of roentgen rays.

The majority of lymphedemas are of inflammatory origin. The role of infection in the production of recurrent attacks of acute lymphangitis and the importance of reinfection and local tissue sensitivity as dual factors in recurrent attacks are emphasized. Periphlebitis accompanying venous thrombosis is a frequently observed form of inflammatory lymphedema.

The degenerative type occurs when regional lymph nodes are blocked by malignant metastases. This may lead to retrograde spread of metastases. It is emphasized that in every case of slowly increasing lymphedema, without obvious congenital traumatic or inflammatory etiology, biopsy of regional nodes should be considered to rule out Hodgkin's disease, lymphosarcoma, or other malignancy.

Atypical mixed forms of lymphedema include the so-called "bartender's legs," causalgic edema, and recurrent (allergic) lymphedema.

The objectives of treatment are: (1) immediate mobilization of edema fluid, (2) the prevention of reaccumulation of fluid in the dependent position, and (3) removal of irreversibly damaged fibrous tissue and nondraining pools of stagnant lymph. In the acute stage, be it traumatic, inflammatory, or allergic in origin, elevation of the extremity, frequent active movement, and elastic compression are of primary therapeutic importance. Sympathetic block may be of value when the extremity is cold and cyanotic or presents diminished pulsations with vascular pain. Moderate mercurial diuresis may be useful. Heparin is of considerable value in the acute phases, particularly in the lymphedema associated with thrombophlebitis. Heparin facilitates the uptake of extravasated plasma into the lymphatics, militates against the thrombosis of lymph channels, and probably releases vasospasm. Roentgen therapy is of proved value. Usually, 50 to 80 roentgens are optimal for acute cases.

Since chronic lymphedema is an irreversible process, the objective of treatment can only be an arrest of the disease to prevent further deterioration or the removal of all possible edematous tissue without sacrifice of function.

Elastic hose, nightly elevation of the affected part, mercurial diuretics, low salt diet, and restricted water intake are accepted conservative aids. If the lymphedema is due to malignant invasion of regional nodes, x-ray therapy to these areas frequently is beneficial.

The modification of the Kondoleon operation, as described by Sistrunk and by Homans, was performed on 28 patients. After follow-up for periods of from 1 year to 25 years, 17 results were judged satisfactory, 5 were doubtful, and 6 were poor.

CURTIS ARTZ, M.D.

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

The General Action of Novocain in Surgical and Traumatic Shock (L'action générale de la novocaïne dans le choc opératoire et traumatique). A. BERNER. *Helvet. chir. acta.* 1949, 16: 372.

It has been known for some time that novocain has general effects on the organism in addition to its local anesthetic action. Given intravenously, it has been used successfully in various medical disturbances such as asthma, pulmonary embolism, paroxysmal tachycardia, dyspnea of various origins, and neurologic disorders.

Quite recently, intravenous infusion of a 1 or 2 per mille solution has come into use for general analgesia in postoperative pain. This method permits reduction of the amount of morphine required or obviates the use of this drug altogether. As novocain is destroyed rapidly in the circulation no danger of cumulation exists.

The author has studied the effect of novocain for the prevention and treatment of surgical and traumatic shock and reports good results in a series of 78 operative patients. He uses a 2 per mille solution in saline solution, sometimes combined with luminal (1/10 per mille), atropine (1 mgm. in 2 liters of the solution), and vitamin C. The patients received between 500 and more than 2,000 c.c. of this solution during the hours following the intervention by the gravity method, the rate of infusion ranging from 60 to 100 drops per minute. Although no statistical figures could be given, the clinical impression was that novocain, given intravenously, is a valuable adjuvant in the prevention and treatment of primary and secondary shock, in addition to its having analgesic qualities.

To these clinical experiences the author added experiments in rabbits. After the application of a tourniquet around the thigh, the leg of the animal was crushed by hammer blows; the tourniquet was left in place for 5 hours and then released. Immediately before release of the tourniquet, novocain (from 0.025 to 0.05 gm. per kgm.) was injected intravenously. Whereas the control animals died from 15 to 20 minutes after release of the tourniquet, the rabbits treated with novocain survived much longer, and the drop in the blood pressure occurred much more gradually. Even better results were obtained when the novocain was given intraperitoneally rather than intravenously. In these cases the animals survived for from 2 to 4 hours.

Finally, the author discusses the etiology and mechanism of surgical shock. Of the various causative factors the most important are reflex vascular atony and the release of acetylcholin, histamine, and adenosin triphosphate. These substances produce vasodilation and consequently reduce the volume of circulating blood which leads to hypoxemia of the tissues.

The beneficial action of the intravenous administration of novocain on traumatic and surgical shock is probably due to several factors. It has been known for some time that novocain is an antagonist to histamine and acetylcholin. The author was able to prove that it also neutralizes adenosin triphosphate. Furthermore, novocain acts as a depressant to the sympathetic as well as to the parasympathetic system, according to which of the two is predominant in the clinical picture. Finally, the analgesic effect of novocain probably is another important factor in the prevention of shock.

The author does not recommend that novocain be placed in the peritoneal cavity before the abdomen is closed. Although novocain is destroyed more slowly by this method, the dosage is uncertain and cannot be modified subsequently according to the needs of the case. WERNER M. SOLMITZ, M.D.

Thromboembolism. A Comparison of the Effect of Early Postoperative Ambulation and Dicumarol on Its Incidence. JAMES C. MCCANN. *N. England J. M.*, 1950, 242: 203.

The attempts to reduce the incidence of postoperative thromboembolic disease by employing early postoperative ambulation and, later, dicumarol administration are reported. In unselected groups of over 500 patients each, there was no significant observed reduction in thrombotic or embolic phenomena when early ambulation was practiced. Similar to the experiences of others, 60 per cent of the so-called failures of early ambulation occurred in patients who were older than 50 years.

In 1948, early ambulation was practiced by 463 patients selected for their youth and vigor. Another group of 62 patients who were confined to bed by severity of illness, depletion, or obesity was treated by administering dicumarol in doses of 100 to 200 mgm. to each patient until active ambulation was achieved. The prothrombin time was maintained at from 40 to 50 per cent of normal. The incidence of thrombosis in the 463 ambulatory patients was reduced to about two-thirds of the previously observed rate. There were no thromboses in the 62 bedridden patients, half of whom were past 50 years of age.

The incidence relations of thromboembolic complications to age and to certain types of operations (pelvic, intestinal, and gall bladder) are again demonstrated. LEONARD D. ROSENMAN, M.D.

Anaphylactic Reaction Following Injection of Heparin. AMOZ I. CHERNOFF. *N. England J. M.*, 1950, 242: 315.

The occurrence of reactions following the use of anticoagulants in the management of patients with myocardial infarction, pulmonary infarction and

thrombophlebitis, and after vascular surgery, has served to emphasize the potential danger of these drugs. In general, the reactions either have been local (pain, abscess formation, hematoma, necrosis) or have resulted from overdosage, with bleeding into various parts of the body.

Within the past year, 3 cases of probable allergic reactions to heparin have been observed in the Barnes Hospital. One of the patients exhibited urticaria; the other 2 had anaphylactic reactions which, in 1 patient, almost terminated fatally.

As in previous cases of reaction following the use of heparin, the exact nature of the sensitizing antigen remains obscure. Whether the reaction was caused by a sensitivity to heparin or to contaminating proteins in the extract could not be definitely determined. The fact that the patient reacted less, on direct skin test, to the concentrated extracts of beef and pork protein than to the heparin solution suggests that heparin itself may have been the responsible agent. Also, the patient gave positive skin tests to both heparin solutions, despite the fact that they came from two different animal sources. The passive transfer data, likewise, were suggestive but not conclusive. Reagins to heparin solution and to both pork and beef were demonstrated. Attempts to neutralize these antibodies met with equivocal results. The passive transfer sites containing serum previously treated with heparin failed to react with either of the two heparin preparations, or with beef or pork protein. On the other hand, pork serum and beef serum mixtures reacted not only with the heparin solutions but also with pork and beef antigens. The evidence obtained in the case reported suggests, but does not prove, hypersensitivity to heparin itself. BENJAMIN GOLDMAN, M.D.

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

The Necessity for Tracheotomy in the Treatment of Tetanus to Prevent Lethal Respiratory Complications. OSCAR CREECH, J. P. WOODHALL, and ALTON OCHSNER. *Surgery*, 1950, 27: 62.

Despite the evidence of active immunity to tetanus resulting from inoculation with formalized toxin as early as 1927, the experience of the American and British Armies in World War II, the better understanding of the pathologic physiology of the disease, and the effective means of producing active and passive immunity, tetanus remains a common and frequently fatal disease among the civilian population.

If the lethal dose of tetanus toxin becomes fixed and altered by the central nervous system, treatment is of no avail. Since no specific measure is at hand for attacking the altered toxin, the only real hope for reducing the mortality is the improvement of supportive therapy and the prevention of complications.

At the Charity Hospital of Louisiana, a plan of treatment has evolved which has resulted in the gradual reduction of the mortality from tetanus.

Headache, stiffness of the neck muscles, and difficulty in swallowing presented by a patient who has had a recent injury are sufficient to justify a diagnosis of tetanus. The more severe signs are trismus, opisthotonos, abdominal rigidity, dysphagia, and convulsions. The initial phase of treatment should begin on suspicion of the disease.

The initial treatment includes the taking of an accurate history, as the date and type of injury and the sequence of symptoms are especially important with regard to the prognosis. A thorough neurologic examination is imperative when the patient is first seen so that the progress of the disease may be followed up. After the skin test the patient is given 50,000 units of tetanus antitoxin intramuscularly and another 50,000 units diluted with from 300 to 500 c.c. of 5 per cent dextrose in water intravenously. It is important to neutralize any circulating toxin at the earliest opportunity.

The wound, although healed, must be excised. At the site of entry it is excised completely to the normal tissue, and if the wound is large a plaster splint is used. If the signs of tetanus are severe, a tracheotomy should be performed at this time. Cyclopropane or ethylene with curare is the anesthetic of choice.

Following the operation the patient is placed in a quiet, darkened, single room. For mild cases in which a tracheotomy has not been performed, a tracheotomy set and apparatus for maintaining normal respiration should be immediately available should respiratory difficulty arise.

From 5,000 to 25,000 units of antitoxin are given intramuscularly every day for 5 days. Local and intrathecal administration of antitoxin has not been used at the Charity Hospital.

Sedation is given to reduce restless excitability and to control the convulsive seizures. Phenobarbital is given every 6 hours p.r.n., avertin is given rectally every 12 hours p.r.n., and sodium pentothal is given in the event convulsions occur. Curare has not been found useful by the authors. Procaine and avertin given simultaneously were beneficial in 22 cases, as they afforded more complete muscular relaxation and alleviated pain. Procaine given alone may cause considerable central excitation. Trismus, stiffness of the neck and abdominal muscles, and even moderate opisthotonos do not, in the opinion of the authors, in themselves influence the outcome of the disease.

Fluid and nutritional requirements are met by the use of the Levine tube if the patient shows evidence of trismus or dysphagia. The patient is heavily sedated before passing the tube to prevent pharyngeal spasm. Whole blood is given as indicated. An indwelling catheter is used both to prevent retention and to maintain an accurate record of the urinary output. To aid in the prevention of respiratory complications, from 200,000 to 400,000 units of penicillin are given daily. Tracheotomy, if not performed on entry, is done as indicated by progressing signs and *before* the need arises.

Six cases including one death are reported. These cases show the routine of management of patients with tetanus, and especially the indications for and the benefits of tracheotomy by maintaining an open airway and facilitating the removal of bronchial and tracheal secretions.

Profound sedation is not necessary after tracheotomy. The authors believe that death in tetanus is due largely to pulmonary complications which can be prevented by the maintenance of an adequate airway. JACOB T. BRADSHER, JR., M.D.

ANESTHESIA

A New Synthetic French Curare No. 3697 RP (Un nouveau curarisant français de synthèse le 3697 RP). PIERRE HUGUENARD and ANDRÉ BOUÉ. *Anesthésie*, Par., 1950, 7: 55.

The authors report their experiences with a new synthetic curare. Its anesthetic properties were studied in 127 cases and compared with those of d-tubocurare in 9 cases, intocostrin in 19 cases, relaxar in 106 cases, and 3602 RP in 25 cases.

The physiochemical properties of this new agent are described and its effects on skeletal muscle, circulation, smooth muscle, and respiration, and its local effects were analyzed.

In general, the different muscular groups were affected in the same order with this agent as with curare, the diaphragm being the last to become affected, but the margin between paralysis of the abdominal musculature and paralysis of the diaphragm seemed slightly greater with 3697 RP.

This substance seems to be less toxic, no less powerful, and more constant and free of histamine effect. It does not precipitate barbiturate solutions and deteriorates very slowly.

The authors recommend that the drug be given intravenously in an initial dose of 40 to 80 mgm. The first reinjection may be made from 30 to 50 minutes later and should be less than the initial dose. The average dose for a normal adult for an anesthetic of 100 minutes is around 2 mgm. and the maximum 3.5 mgm. per kilogram. EDWARD W. GIBBS, M.D.

Catastrophies Following Local Anesthesia (Les catastrophes de l'anesthésie locale). PIERRE-LOUIS KLOTZ. *Sem. hôp. Paris*, 1950, 26: 333.

The accidents of local anesthesia are too frequent to be viewed with equanimity; they are not, by any means, all known; many of them are imputed to other substances used in connection with the projected anesthesia (adrenalin) or the projected operation. At times these accidents are ascribed to a finding associated with the primary condition for which the anesthesia is employed, such as a cerebral hemorrhage, an attack of epilepsy, or the pressure of a hematoma on a nerve. Nevertheless, enough postmortem examinations have been reported to assure us that very frequently nothing other can be incriminated for the death of the patient than the toxic effect of the drug used as a local anesthetic.

The physicians who most frequently complain of these accidents are the laryngologists and bronchologists, and in this connection the absorptive capacity of the laryngeal structures is recalled, especially when inflammation is present. The fact that so much more of the anesthetics will be tolerated when they are swallowed than when they are penciled on the larynx is ascribed to the fact that the swallowed drug is partially detoxified by the liver before it can reach the general circulation.

Nor are the chemical and toxicological natures of the drug decisive for its toxic manifestations; every type of local anesthetic preparation has its catastrophies. The amount of drug absorbed does not seem to be so important as the concentration in which it is used. A 15 per cent solution of cocaine is 4 times as toxic as a 10 per cent solution.

Dentists complain less of toxic surprises, perhaps because their preparations are injected submucously and therefore exactly dosed, and because they do not use large amounts. The general surgeon also complains little, perhaps because he uses weaker solutions and also because he usually injects his preparations. In fact, external application seems to be the most dangerous method; it is especially so when it is made external to the mucosa and when the mucosa is denuded or inflamed.

Richet and Langlois have shown that the convulsive dose of cocaine is only half as strong for the guinea pig as for the rabbit; a ninth as strong for the dog, and a hundredth as strong for the human being. This, of course, raises the question of the participation in the manifestations of the central nervous system. In fact, local anesthesia is much more precarious for the asthmatic or other allergic individual, for the epileptic, and for the patient in a condition of facile psychic excitation. The barbiturates, apparently by their sedative effects on the central nervous system, are effective antidotes.

With this word of warning the author does not mean to condemn local anesthetics in general nor any of their special modifications, such as their use in regional or nerve trunk anesthesias; however, he thinks that too many of these preparations are used in concentrations far exceeding the need. It has been shown how easily certain areas may be satisfactorily anesthetized by means of injections of plain distilled water or by the application of pressure on certain nerve trunks.

In the debilitated patient, the epileptic patient, and the asthmatic or other allergic patient, the indications for local anesthesia should be carefully studied and nicely adapted to the projected operation. After the operation is terminated the patient should not be allowed on his feet, or to leave the observation ward for at least an hour and then should be accompanied home and watched for several more hours as some deaths have occurred as late as 5 hours after the application of the medicament.

In the immediate, acute attacks, trained personnel should be ready to administer immediate succor, the patient lowered to a reclining position, and analeptics

(caffeine, lobeline, camphor, desoxycorticosterone acetate) administered.

Each hospital staff should meet regularly—as is customary in America—to discuss impartially and without professional reticence every case in which the operator is faced with a problem. In every case of this nature in which the patient is not saved, postmortem examination should be made to determine what might be of help in solving this too little discussed problem. JOHN W. BRENNAN, M.D.

The Effects of Various Anesthetic Agents on Protoplasm. WILLIAM SEIFRIZ. *Anesthesiology*, 1950, 11: 24.

A theory of anesthesia based on the present state of our knowledge can be but a suggestion as to what may take place with loss of sensibility when an anesthetic agent is administered. A further and necessary addition to the original theory of Bernard is experimental evidence that gelatinization of the protoplasm actually takes place on the addition of an anesthetic agent.

This hypothesis of anesthesia based on the gelatinization of protoplasm is supported by experimental evidence; that is, the physical change postulated can be verified, and it occurs no matter what the anesthetic agent may be. Not only does the gelatinization theory supply a satisfactory physical interpretation of anesthesia, but it, unlike other theories, is as applicable to the state of anesthesia produced by one agent as by another, even though the agents differ as much as do chloroform and electrical shock. It is difficult to view anesthesia as a problem in adsorption, permeability, or fat solubility. All of these will contribute to the reaction, but they are not the sole cause. Suppression of respiration is a possible interpretation of anesthesia which does not necessarily involve gelatinization. The precise mechanism of the reversible gelatin of protoplasm in anesthesia is not known. The only statement which can be made with fair certainty is that the physical change observed is due to a chemical reorientation. There are, so far, no exceptions to the general rule which this article supports, that all anesthetic agents, of whatever nature, reversibly gelate protoplasm. The gelatinization of the protoplasm of nerve tissue in higher organisms is the cause of the depression of physiologic activities and loss of consciousness.

MARY FRANCES POE, M.D.

SURGICAL INSTRUMENTS AND APPARATUS

Irritating Effect of the Preservative in Catgut Tubes (Sull'azione irritante del liquido di conservazione dei tubi di catgut). G. BOCCHETTI. *Ann. ital. chir.*, 1950, 26: 554.

The fluid in which catgut is usually preserved contains ethyl alcohol, xylol, cumol, and kalmerid or certain not well identified hydrocarbons.

Varying amounts of the fluid were injected subcutaneously in rabbits. As a rule, a tumefaction with a hard, elastic consistency developed at the site of the injection, increased in size during the first 48 hours, and subsided in from 6 to 7 days. In another series of experiments segments of catgut, 1 cm. in length, were inserted through a short incision into subcutaneous pockets of the abdomen in rabbits. In the third group the latter procedure was repeated, but before insertion the catgut strands were rinsed for 10 or 15 minutes in 95 per cent alcohol. The tumefactions at the sites of insertion of the catgut were identical in the second and in the third groups. In the fourth series of experiments catgut was rinsed 20 minutes in physiologic saline solution. The tumefactions in this series were much smaller than in the other three groups.

The preserving fluid may produce changes ranging from simple leucocytic and histiocytic infiltration to true necrosis of the tissues.

The author recommends the rinsing of catgut in physiologic saline solution before its use in surgery.

JOSEPH K. NARAT, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Bronchographic Contributions to Normal and Pathologic Physiology of the Lungs. Motions of the Bronchi and Trachea (Bronchographische Beitraege zur normalen und pathologischen Physiologie der Lungen. Die Bewegung der Bronchien and der Trachea). E. STUTZ. *Fortsch. Roentgenstrahl.*, 1950, 10: 309.

Various motions of the bronchi may be attributed to the effect of adjoining organs. Such movements may be subdivided as follows: (1) angular motions, (2) axial motions, and (3) changes in the caliber of the bronchi.

Ramifications of the bronchi are mostly of dichotomic character. The angle formed by the branches may spread under the influence of respiratory movements. Furthermore, a forward movement of the trachea, bifurcation, and the main bronchi may be observed during inspiration. The angle between the main bronchi averages in adults from 55 to 65 degrees, and becomes slightly smaller during inspiration. However, this angle diminishes during inspiration when the mobility of the diaphragm is impaired. The angle between the bronchi of the upper and lower lobe increases during deep inspiration. As to angles formed by small bronchi and those of medium size, they may either increase or diminish during inspiration, according to the predominance of traction in the longitudinal or transverse direction.

The bifurcation may move downward during inspiration as much as 2 cm., but the maximal inspiratory elongation of the trachea does not exceed 1.5 cm. The spirals formed by bronchi during expiration are stretched when the person exhales and, in addition, an actual elongation of the bronchi takes place.

Traction in radial direction during inspiration produces dilatation of the trachea. Similar but only slight changes of the diameter of the main bronchi take place during inspiratory movements, while they are more pronounced in small bronchi and those of medium size. JOSEPH K. NARAT, M.D.

Neoplastic Cavities in the Lungs (Geschwulstkavernen der Lunge). RUDOLF PAPE. *Fortsch. Roentgenstrahl.*, 1950, 72: 257.

Thirty-two disintegrating tumors of the lungs were studied roentgenologically.

The location of the tumor and its combination with inflammatory processes determined the peculiarities of its roentgenologic aspect. Approximately ten types could be differentiated, for instance, cavities invading the chest wall, centrally located cavities with irregular outlines, distended cystic, cavities, and so forth.

In approximately two-thirds of the cases roentgenologic signs pointed to the presence of a tumor. The diagnosis became difficult if, in addition to a cavity, secondary abscesses or bronchiectases were found.

In about one-half of the cases the author was able to demonstrate a communication between the cavity and the hilum. JOSEPH K. NARAT, M.D.

Angiocardiographic Studies. Preliminary Report (Ricerche angiocardiografiche. Primi risultati). GIULIO DE GIULI AND GOFFREDO GIANNARDI. *Radiol. med.*, Milano, 1950, 36: 1.

The basis for this report consists of 30 angiocardiographic examinations on 25 subjects. There is no discussion of the cardiovascular pathology; it will be the subject of subsequent articles. The technique followed was by and large that of Robb and Steimberg. This consists in the injection into the cubital vein of large quantities of an aqueous solution of a compound of iodine, very similar to that used for intravenous cholangiography and descending urography. The preparation used by the authors is a mixture, or labile combination of 3.5-diiodo-4-pyridone-N-acetic acid and diethanolamine. It is used in a 70 per cent aqueous solution. The solution is injected into the cubital vein rapidly and the resultant shadows of the heart cavities and those of the large blood vessels are analyzed by means of serial roentgenograms.

The apparatus for taking the roentgenograms was built under the direction of the authors themselves; it is simple and enables the operator to make as many as 6 exposures in 8 seconds. Three trajectories have been used: the sagittal, or anteroposterior, view permits of studying the vascular connections of the upper thorax, the right atrium, and the right pulmonary artery; the right anterior oblique view permits of visualization of the right ventricle and the left auricle; and the left anterior oblique view demonstrates the left ventricle and, especially well, the left pulmonary artery.

The afore-mentioned particulars are, of course, only the most salient features of the advantages to be expected from the method. The test is not more fraught with discomfort for the patient and not more dangerous than the other examinations of this nature which are often used in a routine manner. The authors believe that in the light of these studies research on the pulmonary arteries should be renewed with great interest and industry.

JOHN W. BRENNAN, M.D.

The Roentgenologic Manifestations of Parasternal Omental Hernia. JOHN S. STEWART. *J. Thorac. Surg.*, 1950, 19: 399.

The author presents 3 cases of parasternal omental hernia in which the roentgenologic diagnosis was made preoperatively. Parasternal omental hernias occur relatively infrequently. Preoperative diagnosis is usually based on radiographic demonstration

of a density in either cardiophrenic angle and cephalad displacement of a portion of the transverse colon. In these cases pneumoperitoneum was used as an accessory diagnostic aid. The differential diagnosis of masses at the cardiophrenic angle involves consideration of the following: lymphomas, teratomas, lipomas, neurofibromas, aberrant thyroids, celomic cysts, and peripheral lung neoplasms. The roentgenologic picture may show (1) a soft tissue density at either cardiophrenic angle; (2) the change in position of the gas-filled transverse colon on a conventional lateral film of the abdomen; (3) the cephalad displacement of the barium-filled colon assuming the contour of an inverted "V" or "U"; (4) the presence of air within the soft tissue mass following pneumoperitoneum. There are certain cases in which none of the characteristic roentgen findings are present, so that a definite preoperative diagnosis is impossible. The authors emphasize the use of pneumoperitoneum as an accessory diagnostic aid. FRANK L. HUSSEY, M.D.

Ulcer of the Greater Curvature of the Stomach. Statistical Contribution (Ulcera della grande curva gastrica. Contributo casistico). EMIDIO PROPERZI. *Radiol. med.*, Milano, 1949, 35: 954.

A 50 year old woman who had always enjoyed good health developed symptoms of indigestion (pyrosis, postprandial eructations) more than a year previously. Roentgenology disclosed a constant rather noncharacteristic defect of the greater curvature at about its midportion. There was a typical niche communicating with the gastric lumen, and surrounded by a deep indentation (thickening of ulcer borders). Laparotomy uncovered a large ulcer (about 5 cm. in diameter) of the greater curvature, tending to advance on the posterior gastric wall and adhere to the pancreas. Typical Reichel-Polya gastric resection was done. Histologic examination of the removed specimen was not possible; however, the patient has now enjoyed perfect health for more than 6 years since the operation.

This case is one of 2,139 roentgenologically observed gastric ulcers at the civil hospital of Aquila, Italy, during the past 10 years. Of this number 1,004 were operated upon and the diagnosis was confirmed in 988. The patient here reported is the only one in this material with benign ulcer of the greater gastric curvature, and in whom the nature of the ulcer was confirmed at operation; its benignity was established by a long period of postoperative observation.

After this study and a perusal of the literature the author admits the extreme rarity of benign gastric ulcer located on the greater curvature; however, he maintains that such ulcers occur, and he points to his own observation in substantiation. He refuses to adopt the pessimistic attitude of Sproul who states that it is probably unwise ever to make the diagnosis of benignity in these ulcers of the greater curvature, and that the proportion of malignant to benign ulcer at this location is 1,000 to 1. There are differences between the two types of ulcer; careful and repeated examinations by various techniques and with various projections should be carried out, and the mucosal patterns should be studied with complete, and with residual filling of the stomach. With such care, differences between the two types of ulcer are discernible, in addition, of course, to their divergent ultimate outcome and response to treatment. The benign ulcer of this region tends to present a smooth contour in the form of a segment of a circle, while the ulcerated neoplasm presents an irregular outline as a rule. However, this very smoothness of outline may lead to diagnostic trouble in another direction; this outline may at times be indistinguishable from the contralateral spasm of ulcer of the small curvature. Here the characteristic pain in the back of the ulcer of the greater curvature—perhaps due to the tendency of this ulcer to involve the posterior wall of the stomach and thus attain the pancreas—is quite different from the epigastric pains of ulcer of the small curvature.

However, it is in the distinction between malignancy and benignity that the greatest significance lies, and every effort should be bent to the solving of this problem. JOHN W. BRENNAN, M.D.

Modifications in the Antrum in Ulcer of the Lesser Curvature of the Stomach (Modificazioni dell'antro nell'ulcera della piccola curva dello stomaco). ANTONIO GAVAZZENI *Radiol. med.*, Milano, 1950, 36: 16.

Ulcer of the lesser curvature of the stomach frequently induces changes in the antrum. These changes occur so frequently as to constitute one of the classic pictures of the indirect effects of ulcer in general and frequently serve as a guide to the presence of an ulcer of the lesser curvature which is not otherwise detectable.

When the ulcer is juxtapyloric or involves the antral or horizontal portion of the lesser curvature, the relationship between the two conditions is easy to understand and interpret. However, such antral changes are just as frequently observed in ulcer of the vertical portion of the lesser curvature at a notable distance from the antrum itself. Here the antral changes may be hard to distinguish roentgenologically from neoplasm. Of course, in the purely spasmodic forms of antral response, antispasmodic medication or the results of antiulcer treatment will solve the problem. However, in the more advanced changes with hypertrophic or gastritic changes of the antral wall, the narrowing of the passage may be unaffected by any form of treatment and, in fact, may persist unaltered long after the ulcer niche has healed and is no longer demonstrable roentgenologically.

In this latter instance, of course, the mucosa is, as a rule, unaffected and the mucous folds are plainly visible or may even be exaggerated above the normal. Nevertheless, this is not always the case, and in such instances the condition can hardly be distinguished from a primary antral lesion (neoplasm) without operation.

The author speculates on the cause of this antral response, and despite the fact that the antral pathology frequently exhibits no quantitative relationship to the lesion of the lesser curvature and histologic studies have failed to show any involvement of the nerves leading to the antrum, he suggests neurovascular reaction of the lesser curvature, and believes that the ulcer in these cases is the primitive lesion, leading first to spasm in the antrum and later to gastritic and hypertrophic modifications.

In all such instances every effort should be made to discover the primitive lesion and to produce a return to normal of the antral lesion by vigorous antiulcer treatment. JOHN W. BRENNAN, M.D.

Roentgen Studies of the Upper Gastrointestinal Tract in Vagotomy. FRANK ISAAC, RICHARD E. OTTOMAN, and JOSEPH A. WEINBERG. *Am. J. Roentg.*, 1950, 63: 66.

After adequately reviewing the literature, the authors present 83 consecutive cases in which they performed vagotomy, with postoperative roentgen examinations. Of the 83 patients, 75 had check-ups at 1 week, 72 had check-ups at 1 month, and 50 had check-ups at 6 months.

The changes in the stomach were (1) loss of tone, (2) delayed motility, and (3) decreased peristaltic action. The most constant of these was the latter, but all were frequently encountered. Likewise, all showed a marked tendency to regression with the passage of time. At the end of 6 months approximately 50 per cent still showed clear-cut changes. A definite correlation was found between the postoperative changes and the type of procedure. A larger percentage of patients demonstrated complete return to normal after combined vagotomy and gastroenterostomy than after simple vagotomy. No differences were detected between the thoracic and abdominal procedures.

Ulcer craters in the duodenal bulb responded dramatically, approximately 65 per cent disappearing by the end of 6 months. No correlation was noted between the degree of gastric change and the disappearance of the crater.

In the small intestine there was transient dilatation of the duodenum and delay in intestinal motility, permanent in nature, at least to 6 months.

NORVAL F. ZIMMERMAN, M.D.

Displacements of the Ureters Resulting from Abdominal Tumefactions (Gli spostamenti dell'uretere nelle tumefazioni addominali). U. BRACCI and G. PEZZUOLI. *Riv. ostet. gin.*, 1949, 4: 417.

The authors describe typical displacements of the ureter by retroperitoneal tumors, renal tumors, tumors of the suprarenal glands or of the pancreas, the lymph glands of the abdomen, aneurysms, bone tumors, cold abscesses, intraperitoneal swellings and tumors, tumors of the ovary, and displacements resulting from pregnancy and adnexal inflammatory processes. Most of the conditions here listed are illustrated by roentgenographic reproductions and some of the more interesting conditions are completed by brief case histories.

The ureter undergoes displacement only under certain definite contingencies. Any intumescence must be retroperitoneal if it is to have any marked effect on the course followed by the ureter from the renal pelvis to the bladder. The displacements in the upper two-thirds are directed laterally, medially, or anteriorly, and in the lower third, only anteriorly and posteriorly. Of course, the anterior displacements may be combined with the others in some instances.

The anterior displacement of the ureter occurs when the intumescence occupies a plane in the retroperitoneal tissues which lies deeper than does the ureter itself. However, this applies only to the trajectory of the ureter which lies above the superior strait of the pelvis; in the pelvis itself the ureter will be displaced anteriorly only by a push from behind. Intraperitoneal processes (tumors, abscesses, edema) will not be able to produce anterior displacements; therefore, when such conditions are encountered it is practically certain that originally intraperitoneal processes will have invaded the retroperitoneal tissues. Thus, when a tumor has displaced the ureter medially (or laterally) and seems to be a tumor of the mesentery of the intestines, it is probably a neoplasm of the mesentery of the large intestine because of the intimate contact of this structure with the retroperitoneal tissues.

In addition to these more general principles, it may be adduced that neoplasms of suprarenal origin will displace the upper portion of the ureter anteriorly, and this applies also to tumors of the vertebral column and of the posterior wall in general. The growths of the kidneys and the pararenal tumors will push the ureters medially and laterally, but seldom anteriorly. The room occupying conditions of the para-aortic lymph glands, pancreas, mesocolon, and vessels (aneurysms), and the intumescences of the liver, spleen, and mesentery, that is, the endoabdominal growths in general, will displace the ureter laterally or medially, but never anteriorly.

In view of the peculiar behavior of the various parts of the ureter, it is divided arbitrarily into three sections, or thirds; however these divisions are not mathematically precise. The upper third extends from the renal pelvis to the level of the third lumbar vertebra, the medial third from this point to the upper margin of the sacroiliac articulation, and the lower third from the latter point to the opening into the urinary bladder.

With reference to this classification, it may be stated in general that the displacements of the upper third occur in tumefactions of renal or pararenal, suprarenal, and para-aortic lymph glands; exceptionally, in tumefactions of the pancreas, liver, and spleen; and in cold abscesses, and tumors of the bones and muscles, and of the nerve roots. As a rule, in this region the displacements will be medial from tumors of the kidney, and lateral from tumefactions of the lymph glands and of the pancreas.

The displacements of the middle third are produced by pararenal tumors, cysts and tumors of the mesocolon, tumors of the lower pole of the kidney, and, rarely, by tumors of the lymph glands, bones, and blood vessels (aneurysms). The behavior of this portion is otherwise entirely identical with that of the upper third.

The displacements of the lower third of the ureter, with the exception of a few instances of tumors of the bone and nerves in the region of the sacrum, are produced almost exclusively by the lesions of the female genitalia. The tumors of the ovary, when they have attained a certain size, quite frequently produce displacement of the lower third of the ureter; however, the effects produced are quite different and depend upon whether the growth lies free in the peritoneal cavity, develops within the broad ligament, or, finally, becomes wedged in the pelvic cavity. A characteristic and interesting finding is the tendency of the vesical embouchure of the ureter to be drawn toward the side on which the tumor has developed.

In uterine fibromas the course of the ureter is little affected except in deeply lying forms, that is, tumors of the lower portion of the uterine corpus, of the cervix, and of the posterior surface of the uterus. The deviation of the ureter is contrary to that shown for the intraligamentous tumors of the ovary. In the uterine fibroma the vesical end of the ureter is pushed aside rather than drawn toward the side of the neoplasm. The displacement is frequently lateral and anterior and is more conspicuous on the left side.

In conclusion, the authors maintain that the displacements of the ureters constitute semiologic data of great value. Even the intraperitoneal growths are frequently of great interest in the diagnosis and in rare instances may constitute the deciding factor.

JOHN W. BRENNAN, M.D.

Phlebography in Chronic Venous Insufficiency of the Lower Extremity. A Preliminary Report. I. C. HØJENSGÅRD. *Acta radiol.*, Stockh., 1949, 32: 375.

Chronic venous insufficiency is a term applied to all chronic conditions in which the venous return is impaired because of destruction of the venous-muscular pump mechanism. The entity may be divided into (1) insufficiency of the superficial venous system (primary or idiopathic varicosities), and (2) insufficiency of the deep venous system (postthrombotic conditions).

The author states that he has had no experience with the phlebographic diagnosis of acute thrombosis, therefore this topic is not discussed.

The treatment of primary varicosities with sufficient valves in the deep veins is well established. The most common procedures are ligation of the affected superficial venous trunk at the junction with the femoral vein (insufficiency of the great saphenous vein) or the popliteal vein (insufficiency of the small saphenous vein), and extirpation or chemical obliteration of the varicose vessels. The postthrombotic conditions are treated in various ways, most of the procedures being rather unsatisfactory. Recently ligation of the insufficient deep vein, either the femoral or popliteal vein, is being attempted but the cases in which this method of treatment has been used are too few to allow any conclusions as to its efficacy.

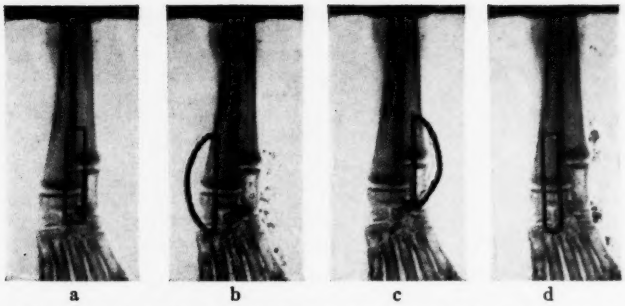
In view of this great variation in the therapeutic results of the two types of venous insufficiency, and since in most instances clinical examination alone cannot give enough information about the state of the deep veins, phlebography may prove of definite diagnostic value. It helps to visualize whether the deep veins still have normal valves or whether they are recanalized and valveless, whether there are any permeable deep veins at all, or whether there are merely collaterals.

It is the author's opinion, however, that ordinary phlebographic technique with the leg in horizontal position is unsatisfactory for this purpose and, therefore, he recommends a technique with the leg in vertical position. The following are the advantages of this technique: (1) owing to better filling of the veins the valvular sinus is shown more distinctly; (2) all veins fill more uniformly, whereas with the limb placed horizontally the posterior (lower) veins will fill more than the others; (3) in the horizontal position lateral roentgenograms convey the impression that the opaque medium runs along the posterior aspect (bottom) of the major veins, thus rendering difficult an exact evaluation of the size and outline of the vein, while in the vertical position this fact is obviated; (4) it also obviates the compression of the deep veins by the calf muscles, which is present when the leg rests horizontally on the calf; and finally (5) vertical phlebography is superior to horizontal phlebography because of physiologic reasons.

The technique of vertical phlebography, which is that of Lofstedt with few minor modifications, is described in detail. The patient sits on a high chair or stool, the leg to be examined hanging down. At least two roentgenograms are made in each view (anteroposterior view with about 30 degrees of internal rotation and lateral view with 10 to 15 degrees internal rotation of the leg) so as to allow for the individual variation in the rate of the blood flow which is fastest in normal, and slowest in postthrombotic, individuals.

The injection is done percutaneously. To prevent the dye from selecting the superficial veins a tour-

Deep veins of the leg:	In normal subjects	In primary varicosities	In postthrombotic conditions
Course	Straight	Straight	Irregular, tortuous
Outlines	Even	Almost even	Irregular
Lumina	Regular	Fairly regular	Extremely irregular
Valves	Numerous	Numerous, usually distinct	None
Collaterals	None	A few	As a rule, many



a b c d

Fig. 1 (Langenskiöld, Edgren). The single dose irradiation of distal parts of the ulna, the radius, or both was localized in four different ways (a-d). Fields irradiated have been marked out on films of a normal extremity.

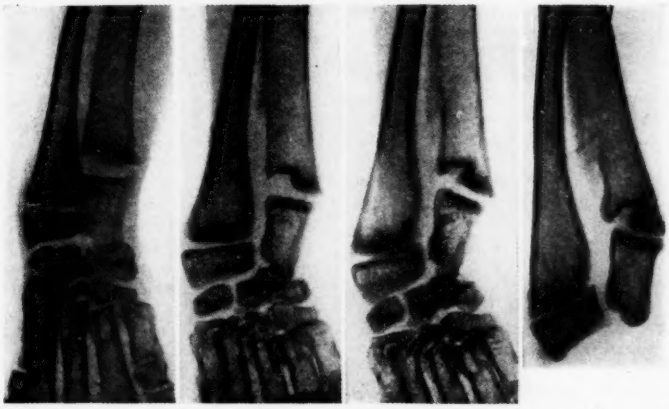
niquet is applied firmly around the malleolar region, and in the presence of varicosities an elastic bandage must be wound around the leg after it has been emptied of blood by elevation. In case of suspected or actual thrombosis a tourniquet is placed also immediately below the knee.

On the basis of more than 200 limbs examined, certain characteristic features were established for the two types of chronic venous insufficiency. These are shown in the accompanying table.

T. LEUCUTIA, M.D.

Imitation of Chondrodysplasia by Localized Roentgen Ray Injury—An Experimental Study of Bone Growth. A. LANGENSKIÖLD and W. EDGREN. *Acta chir. scand.*, 1950, 99: 353.

Observations on the pathogenesis of chondrodysplasia and the mechanism of normal bone growth gave reason to assume that roentgen ray irradiation of limited portions of epiphyseal plates would provoke foci resembling the cartilaginous foci seen in Ollier's disease, and developing in the same characteristic manner as they do. In young rabbits, single heavy doses of roentgen rays were applied to limited portions of the distal epiphyseal cartilages of the radius, the ulna, or the femur. The developmental changes provoked in 23 animals were followed by repeated roentgenography during periods of 10 to 131 days. Sections of 18 injured bones were studied microscopically. The working hypothesis proved correct. Injured cartilage portions persisted as obliquely situated foci in the metaphysis and were more slowly replaced by bone than the normal cartilage. The microscopic examinations showed that the pathologic portions of the cartilage were pushed aside by the unirradiated cartilage growing in a transverse direction. In several experiments deformities appeared which indicated similarity to those seen in



a b c d

Fig. 2. Roentgenographs of an extremity after application of 9,500 roentgens localized in a manner shown in Figure 1a, and the same dose as in Figure 1b. The focus in the ulna. The effect on the radius was too peripheral to provoke distinct foci; a, 24 days after irradiation; b, 30 days; c, 37 days; and d, 41 days.

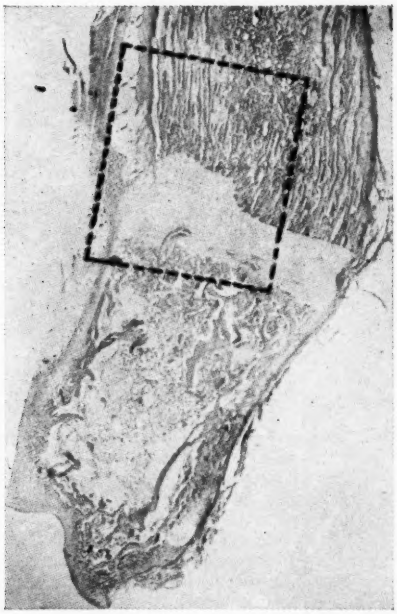


Fig. 3. (Langenskiöld, Edgren). Photomicrograph of an ulna showing changes which developed during 10 days from application of 11,200 roentgens to the field shown in Figure 1a.

chondrodysplasia. Ollier's belief that foci appearing in the disease carrying his name arise by the persistence of portions of the epiphyseal cartilage, which are only slowly replaced by bone, is considered correct. In this disease the characteristic development of metaphyseal foci into diaphyseal foci is caused by normal areas of epiphyseal cartilages growing transversely and finally taking up the entire width of the epiphyseal plates. The "oblique lines" in the metaphyses in Ollier's disease are traces left behind by the limits between normal and pathologic cartilage. The experiments support the views concerning the pathogenesis of other forms of chondrodysplasia. In normal epiphyseal cartilage the interstitial growth of the layer generally called "the layer of the reserve cells" causes an expansion of this layer and a successive displacement of its cells to the periphery in relation to the bony epiphysis and the cartilage cell columns. FRANK L. HUSSEY, M.D.

MISCELLANEOUS

Radioactive Iodine in the Diagnosis of Thyroid Disease. BENGT SKANSE. *Acta med. scand.*, 1949, Supp. 235.

During the years from 1946 to 1948 Skanse, in the dual capacity of a Rockefeller and a Henry P. Walcott Fellow, carried out a series of investigations on radioactive iodine at the Thyroid Clinic of the Massachusetts General Hospital, the Department of Medicine of the Harvard Medical School, and at the Radioactivity Center of the Massachusetts Institute of Technology. In this monograph he presents the results of his investigations, dealing particularly with the radioactive iodine tolerance test as an effective and reliable aid in the diagnosis of thyroid disease.

The subject is divided into twelve chapters: (1) introduction; (2) historical review; (3) methods; (4) clinical material; (5) urinary excretion of I^{131} in normal and totally thyroidectomized patients; (6) comparison of the I^{131} tolerance test with other laboratory tests in patients with thyroid disease; (7) factors that may influence the I^{131} tolerance test; (8) use of the test in diagnosis; (9) differential diagnosis of thyrotoxicosis; (10) collection of I^{131} by the thyroid; (11) general discussion; and (12) summary.

The iodine tolerance test is based on the observation that if a certain dose of iodine is administered to a patient, it is either taken up by the thyroid gland or excreted in the urine. In patients with total thyroidectomy all iodine is excreted in the urine. Thus, by determining the urinary excretion of the iodine one can indirectly estimate the uptake of the iodine by the thyroid gland.

Skanse standardized the test by administering orally a dose of 100 micrograms of inactive iodine labelled with 100 microcuries of radioactive iodine (I^{131}) and measuring the amount of I^{131} excreted in the urine in two 24 hour periods. The value of the test has been compared with that of the basal metabolic rate, the serum-protein bound iodine, and the serum cholesterol. The material studied included 110 normal persons and 385 patients afflicted with various diseases, mostly of thyroid origin. In this latter group, 172 patients were in a euthyroid state, 187 were in a hyperthyroid state, and 26 in a hypothyroid state.

It was found that the test expresses satisfactorily the state of the thyroid function. In thyrotoxicosis, the diagnosis is incorrect in only 2 per cent of cases, whereas, by means of the basal metabolic rate it is missed in 22 per cent of cases, and with the serum-protein bound iodine test it is missed in 7 per cent of cases (the serum cholesterol is of negligible diagnostic value). The test also compares favorably with euthyroid and myxedematous patients. A careful control of certain variables involved in the actual performance of the test is necessary.

T. LEUCUTIA, M.D.

Some Biologic Effects of Long Continued Irradiation. EGON LORENZ. *Am. J. Roentg.*, 1950, 63: 176.

The author shows by experimental approach that chronic irradiation reduces the life span of mice and guinea pigs. This effect is demonstrated as presenile aging in mice and in guinea pigs, and death comes as a result of pancytopenia. The radiation in these experiments was derived from radium with platinum

filters, thereby yielding gamma type radiations over a long period of time.

The mice, in addition, developed lymphoid tumors, leucemia, lung tumors, mammary tumors, and ovarian tumors; the rabbits used developed uterine tumors; the guinea pigs, on the other hand, were found to be fairly resistant to radiation carcinogenic effects. JANE C. MACMILLAN, M.D.

The Reciprocal Vicinity Effect of Irradiated Tissues on a "Diffusible Substance" in Irradiated Tissues. BENJAMIN JOLLES. *Brit. J. Radiol.*, 1950, 23: 18.

The severity of skin reactions to roentgen rays depends on the size of the area irradiated; also, the dose per unit area remaining unchanged, the reaction becomes a minimum when the normal tissues can exert their maximum protective role; therefore, the degree of effect must depend on the product (dose x area) rather than on dose alone. When a volume of untreated tissues or area remains interposed between two neighboring irradiated volumes or areas, the dose can be raised. The author reports the results of an experimental study on the factor of untreated protected skin adjacent to treated areas and the resultant skin reaction.

On the upper half of the thighs of human volunteers a dose of x-rays was administered to two small areas of skin separated by a varying width of untreated protected skin, and a single area was exposed to an equal amount of radiation on a symmetrical site.

Quality of radiation of half value layer 0.85 to 1.0 mm. of copper was used in the majority of cases, a single dose of 800 roentgens being given. Suitable checks were undertaken so that the only variation concerned the separation between two neighboring squares of the same size. Sixty-seven experiments were carried out on 30 subjects.

Briefly, the results indicated that when the separation between the two paired areas was greater than a certain minimum value, the reaction of each square was equal to that of a single area at a symmetrical site. Separations of paired areas less than the minimum value produced a reaction significantly greater in each than that over a single area of the order of plus 25 per cent. The time of appearance of this latter effect, the reciprocal vicinity effect, varied according to the size of the irradiated areas.

Another article by the author was discussed and quoted insofar as it further elucidated the relationship of the irradiated area to the surrounding normal tissue zone. Tables have been derived from data in this previous article which served to show that the degree of the reaction is proportional to the factor of dose x area. The late Dr. D. E. Lea, of Cambridge, in a critical review of the previous article, believed that "the skin reaction is produced through the intermediary of a diffusible substance" and that the observed reactions could be explained on the basis of a quantity of some diffusible substance being produced (or destroyed), depending on the mean dose (to which dose x $cm.^2$ is proportional).

The present experiments further suggest that some diffusible substance is probably produced in the irradiated tissues. This hypothetical substance diffuses so that the concentration attained is proportional to dose x $cm.^2$ distance. The dimensions of the "distance" under the conditions of the experiment are such that the substance has no obvious effect beyond 2 cm. for an area of 2.5 $cm.^2$, 3 cm. for an area 6.25 $cm.^2$, and 4 cm. for an area 12.5 $cm.^2$ It is inferred from this work that assessment of skin reactions of a number of exposed areas should consider the spacing of these areas to obviate error due to the vicinity effect.

The article is accompanied by 9 figures and 2 tables. JOHN M. PHILLIPS, JR., M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Studies on the Protective Action of Face Masks (Untersuchungen ueber die Schutzwirkung der Mundmaske). RUDOLF SCHNEIDER. *Chirurg*, 1950, 21: 74.

To test the protective value of face masks as they are used in surgery, Petri dishes with blood agar were exposed to test persons wearing a mask. The person had to speak for 5 minutes and to cough 12 times during this period. The distance from the mouth to the Petri dish was 3 cm. in one, and 40 cm. in another series of the experiments. The number of colonies grown on the dishes was counted.

Some colonies grew in all cases. It made no difference as to the number of colonies whether the mouth only, or nose and mouth were covered by the mask. With persons suffering from the common cold or upper respiratory infections, the amount of colonies was about 3 times higher than with normal persons. When the test person spoke in a loud voice the amount of colonies was slightly higher than when he spoke low. It is remarkable that the number of colonies was higher at a distance of 40 cm. than that of 3 cm. To explain this surprising fact the author suggests that at the 3 cm. distance, the dishes collect only bacilli from the mouth and nose, whereas at the 40 cm. distance additional germs from the air get onto the dish.

A mask worn for 1 or 2 hours proved just as effective as a fresh mask. The great majority of bacteria grown in the culture were nonpathogenic in the case of healthy persons. However, when the individuals were suffering from respiratory infections, from 2 to 9 per cent of the colonies were hemolytic staphylococci or streptococci.

WERNER M. SOLMITZ, M.D.

Undulant Fever; A Neglected Problem. WELDON DALRYMPLE-CHAMPNEYS. *Lancet*, Lond., 1950, 1: 429.

Following a good review of the history of the discovery and identification of the Brucella group of bacteria, the author presents a report of 983 proved cases of undulant fever in Great Britain, which he has collected.

The etiology was directly related to the ingestion of raw milk or cream in 666 of the cases. Direct contact with infected animals was apparently causal in some cases.

The incidence of undulant fever is difficult to estimate in Great Britain because it is not a reportable disease. According to the best estimates there are a minimum of 400 to 500 cases per year. This is compared to the 4,000 cases which are reported in the United States and the estimated 40,000 to 100,000 cases of "chronic brucellosis." In Great Britain, undulant fever is due to Bacillus abortus, while in the United States it is due to Bacillus suis, Bacillus melitensis, and Bacillus abortus. The incidence is lowest in localities where the milk is pasteurized.

The incubation period of the disease is about 2 to 4 weeks, but may vary considerably. It is most common in males in the 30 to 50 year age group, but the range is from 22 months to 86 years, and includes both sexes. Clinically the disease has been divided into a number of catagories depending upon the severity of the disease.

Signs and symptoms include: sweating, 77%; weakness, 70.6%; headache, 63.6%; malaise, 61%; anorexia, 54.3%; pain other than headache, arthralgia, or abdominal pain, 53.3%; constipation, 41.6%; rigors, 33.4%; splenomegaly, 21.6%; cough, 18.7%; sore throat, 15.8%; arthritis or arthralgia, 11%.

Almost any disease entity may be mimicked. In 8 per cent of patients there was abdominal pain misdiagnosed as appendicitis, cholecystitis, nephritis, or perinephric abscess, gastritis, tuberculous peritonitis, pyelitis, and hepatitis. Due to the vagueness of complaints in many cases, the diagnosis of psychoneurosis may sometimes be made mistakenly.

Diagnostic criteria are variable. The author's are: (1) positive culture (blood or tissue); (2) clinical picture consistent with undulant fever; and (3) agglutination of not less than 1 to 100 (also cross agglutinates with tularense).

The accuracy of these tests, as well as the complement fixation test (slow), the intradermal test (most valuable if negative), and the opsonocytophagic index (helpful if used with other tests) examinations, which are frequently used in the United States, are discussed. In addition there may be anemia (17%) and relative or absolute lymphocytosis.

Differential diagnosis includes most of the febrile diseases, including influenza, typhoid, paratyphoid fevers, tuberculosis, malaria, enteric fever, pneumonia, and rheumatic fever.

The prognosis is extremely variable. There is an overall mortality of 2 per cent. The disease lasts a little over 4 weeks in about 27 per cent of cases, from 4 to 12 weeks in about 50 per cent of cases, and 6 months to 46 years in 6.5 per cent of cases. Figures are not available on the other cases. Relapses are very common.

Treatment has not been very effective although streptomycin with sulfonamides, aureomycin, and chloromycetin show promise. Prior to the use of these drugs, the author found protein shock most effective. Control of the source of infection by milk pasteurization, and cattle vaccination and slaughter are needed to eliminate the disease.

ROBERT L. CRAIG, M.D.

Congenital Lymphedema. Case Report with Results of Surgical Correction. GULDEN MACKMULL and S. DANA WEEDER. *Plastic & Reconstr. Surg.*, 1950, 5: 157.

A case of congenital lymphedema of one leg is presented.

At the age of 25 years, the first stage of a modified Kondoleon-Sistrunk operation was performed. Bacteriological examination of the excised tissue displayed the feature of staphylococcus albus hemolyticus, cultured both aerobically and anaerobically. Twenty days later, the second stage of the operation was performed, with sacrifice of the internal saphenous nerve and vein. During the hospitalization, penicillin was used continuously. The authors believe that a material improvement in the leg has resulted from the operation.

JOHN J. BALLENGER, M.D.

The Psychology of the Surgical Patient. ALEXANDER KENNEDY. *Brit. M. J.*, 1950, 1: 396.

When any serious surgical procedure is contemplated, the patient's attitude to his disability must always be considered. Psychological factors undoubtedly augment or destroy the will to live through severe shock or prolonged sepsis, and profoundly influence the patient's co-operation in rehabilitation.

Few patients can understand the rationale of their treatment, and their lack of comprehension must be replaced by confidence in those who are caring for them. The patient should be told in simple terms why he is having treatment, what to expect from it, if his condition is dangerous, if it is likely to be disabling, how long it will last, and whether to expect discomfort. Care must be taken not to convey dangerous knowledge.

A major operation is a landmark in the patient's life which acquires a magical quality. This great suggestive value can be negated by lack of personal interest on the part of the surgeon. The average patient tolerates many minor psychological traumas during his hospital stay without any permanent effect, but in some circumstances the psychological handling of a case may make all the difference in the functional result. Such moments occur when the patient is critically ill, has had prolonged sepsis, when a series of operations is necessary, when pain cannot be avoided, where long immobilization is necessary, or when discouraging disability has to be faced.

When telling a patient about his illness, his intelligence, the degree to which he is a realist, and the extent to which he is prepared to trust the surgeon must be determined. A trusting, dull-witted man needs only minimal reassurance. Medical terminology must be used with care lest it clash with the averare citizen's crude conceptions of his own interior.

Relatively few patients with malignant disease ask, "Is it cancer?" unless they expect a negative answer. This need not be discussed with the patient unless he is failing to take his treatment seriously. With stable men who must adjust their affairs, however, frank discussion rarely causes more than a temporary depression.

Admission to a hospital interferes with a variety of conditioned reflexes necessary for sleep. If a sedative is used it must be in order to initiate a new routine rather than to become a part of one. Trivial concessions to the patient's personal habits and practical reassurance are helpful.

Long-stay patients tend to become dependent and childlike. Rehabilitation and the assumption of normal responsibilities should be begun as soon as the patient is physically well enough.

The effects of drugs should be appreciated. Sulfapyridine and emetine produce a depression, aggravated by alcohol or benzedrine. Patients premedicated with morphine and hyoscine should not be expected to make conversation, decide questions, or follow instructions.

The daily postoperative call at the bedside is an important moment for the patient and direct interchange must take place between surgeon and patient on these occasions.

Any drug which will relieve pain is potentially habit-forming. The importance of using nerve blocks, sections, and chordotomies at an early stage is evident.

By far the greater number of acute psychiatric emergencies occurring in patients in surgical wards are likely to subside, with good management, within a few hours. Shock, sepsis, metabolic change, and drugs may be responsible. If the psychological strain of illness produces anxiety, panic or hysterical behavior, much can be accomplished by encouragement and reassurance.

Many patients minimize their symptoms because of desire to be back at work, fear of reproof for a needless complaint, or unwillingness to discover a serious disease. Others complain in hopes of ventilating other troubles about which they hesitate to seek direct advice.

It is unwise to operate in a case which would not normally justify surgical intervention and in which the disability is bound up with a pathologic mental attitude. Nothing brings out the best qualities in a mature surgeon more than the decision to leave well enough alone.

In functional disabilities, from minor purposive exaggeration to gross hysteria, the central motive of advantage through illness is the same, though the personality of the patient, the degree of deliberation, and the exciting causes may differ widely. Clinically, it is convenient to distinguish between conversion hysteria, the functional superstructure group, and traumatic hysteria. In the prevention of compensation neurosis, exact diagnosis, absence of delay and ambiguity, and a show of firmness are the best measures.

Early rehabilitation and occupational therapy leave little time for idleness and grumbling.

S. LLOYD TEITELMAN, M.D.

EXPERIMENTAL SURGERY

The Use of Ultrasonic Pulses for the Measurement of Biologic Tissues and the Detection of Tissue Density Changes. J. J. WILD. *Surgery*, 1950, 27: 183.

A method is presented for the detection of changes in tissue densities by means of ultrasonic echoes, and a description is given of the type of apparatus that is required. Ultrasonic waves, like other waves of high frequency, in their passage through media vary with the density of the media, and can be reflected from areas where a change in density occurs.

Many experiments were carried out with various types of biologic tissues, and tracings could be obtained from three layers of the small intestine of a freshly killed dog, and a fresh strip of stomach containing a carcinomatous ulcer. The author illustrates a proposed instrument for intraluminal studies in the human gastrointestinal tract, deeming it possible to detect tumors of the accessible portions of the gastrointestinal tract by detecting density changes and by failure of tumor tissue to normally contract and relax. It is hoped that such studies will reveal tumors long before they are detectable by radiologic methods.

The source of the ultrasonic waves is a thin crystal which can be caused to resonate electronically. The ultrasonic pulses are reflected where a change of density occurs and strike the same crystal, therein being greatly amplified and synchronized by the synchroscope with the transmitted pulses; the time taken for the echoes to return can be measured. Since this degree of time is a function of the density of the medium through which the ultrasonic waves are traveling, the thickness can be measured if the density of the medium is known.

For the detection of tissue density changes in other accessible organs, such as the breast, the crystal could be placed next to the skin and could also be used in physiologic fields, since contracting tissues can be examined. JOHN MOHARDT, M.D.

Electrometric Study of the Healing of Surgical Wounds (Ricerche elettrometriche sulla guarigione delle ferite chirurgiche). LEONE CALVI. *Arch. ital chir.*, 1949, 72: 260.

Evolution of the healing process of surgical wounds may be studied by tensimetric, planimetric, histologic, or electrometric methods. The complexity of electrical phenomena in the skin makes evaluation of the results of electrometric determinations difficult. The visceral activity projected toward the surface is another obstacle in the interpretation of the readings. Finally, spontaneous, erratic fluctuations of the potentials between two points must be taken into consideration. Ionic alterations of the tissues and variations in the liquid content exert an influence on the local electric condition. Wounds produce electric modifications, with inversion of the polarity in some instances.

Electrometric determinations in 15 guinea pigs in the region of a cutaneous incision in the abdominal region convinced the author that definite relations exist between the evolution of the healing process and electric cutaneous manifestations. However the great variability of the findings justifies skepticism as to the value of the method for appraisal of the healing process in laparotomy wounds.

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